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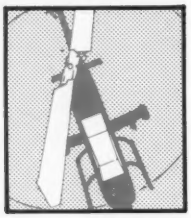

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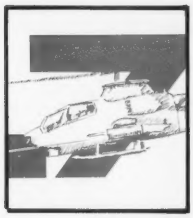

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Honorable John O. Marsh Jr.
Secretary of the Army

Richard K. Tierney
Editor

The mission of the *U.S. Army Aviation Digest (USPS 415-350)* is to provide information of an operational, functional nature concerning safety and aircraft accident prevention, training, maintenance, operations, research and development, aviation medicine and other related data.

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THIS MONTH YOU will find that we continue our focus on one of the most important issues Army Aviation faces today, that of engagements between helicopters. In the lead article, "Helicopter Aerial Combat Week," Captain Greg R. Hampton and First Lieutenant Mario H. Acevedo describe the antihelicopter training program conducted last December at Ft. Hood, TX, by the 6th Cavalry Brigade (Air Combat). The objectives were "to familiarize the 6th Brigade's aviators with threat helicopter systems and tactics, recent air-to-air weapons systems developments and helicopter vs. helicopter aerial tactics." There is an increasingly strong consensus that such training is not nice-to-have—it is essential-to-have! And a tip of our visor to the 6th Cav members for their local initiatives in air-to-air training. With the results of our Mission Area Analysis and Systems Program Review now reflected in the Aviation Development Plan at Department of the Army, we should soon see clear doctrine emerge and the training itself can become institutionalized across the Army.

Preparing for combat is, of course, the name of the game for our Army; and our future preparations have a proud heritage upon which to build. Richard K. Tierney talks about "Combat" in Part 3 of the Army Aviation history series, looking at contributions made in World War II, the Korean War and in Vietnam. Dick's work on this history series has drawn favorable comment from all—those who lived it as well as those who follow.

While we have focused much in recent issues on the air-to-air threat, we also must not lose sight of the fact that all of our enemies are not going to be up in the air with us in tomorrow's battles. Lieutenant Colonel Brian P. Mullady has very ably described "Soviet Air Defenses Against Attack Helicopters" in a three-part series, the last of which is offered to you this month. In it, he writes about ZSU-23-4, perhaps the most formidable ground-based gun threat we face. The article deserves close attention—to learn how the Soviets will employ this gun and how we can overcome that employment. Threat systems can be defeated if you know your enemy.

Our key safety thrust for August is contained in "DES Report to the Field: Dynamic Rollover Accidents" by Chief Warrant Officer, CW4, Michael J. Novosel. Mike is a legend in his own time and as one of our most senior and most respected Army aviators, he has some very sage advice. Heed his counsel as he describes for you a number of accidents that, according to all evidence, should not have happened. These are truly disturbing and we need to hitch up our professionalism a notch or two and put an end to such occurrences. As I stressed last month, it takes much more than the best instructor pilots and safety specialists in the business; it takes **you,** each and every crewmember, to prevent needless accidents.

Finally, I want to share a brief comment with you on a tremendous experience I had in late July when I attended the Silver Jubilee Celebration of the British Army Air Corps. Events at Middle Wallop, England, home of the British Army Aviation Center, included an International Helimeet in which helicopter crews, both civilian and military from many of the NATO nations, competed in precision helicopter maneuvers and navigation; a symposium on the expanding role of the helicopter in this decade; a great Army-Air 82 air display with literally hundreds of helicopters and airplanes on display; and in-flight demonstrations to include many participating aircraft and crews from U.S. Army Europe and our very latest U.S. system, the AH-64 Apache—truly an impressive array of Army Aviation capabilities. The tactics and doctrine symposium was particularly timely in that the commanders of the British helicopter units in the Falkland Island campaign reviewed many of their lessons learned. As is now so well known, helicopters played key roles in every operation—and did their job well. Thus, we salute our long-time ally on this, the 25th Anniversary, Silver Jubilee of their Army Air Corps, as they continue to live up to their motto; "PREPARE."

Major General Carl H. McNair Jr.
Commander, U.S. Army Aviation Center
Fort Rucker, AL

The opinions expressed in this article are those of the author and do not necessarily reflect the views of any Department of Defense agency.

AIR TO AIR

HELICOPTER AERIAL COMBAT WEEK

Captain Greg R. Hampton
First Lieutenant Mario H. Acevedo

December 14–18, 1981

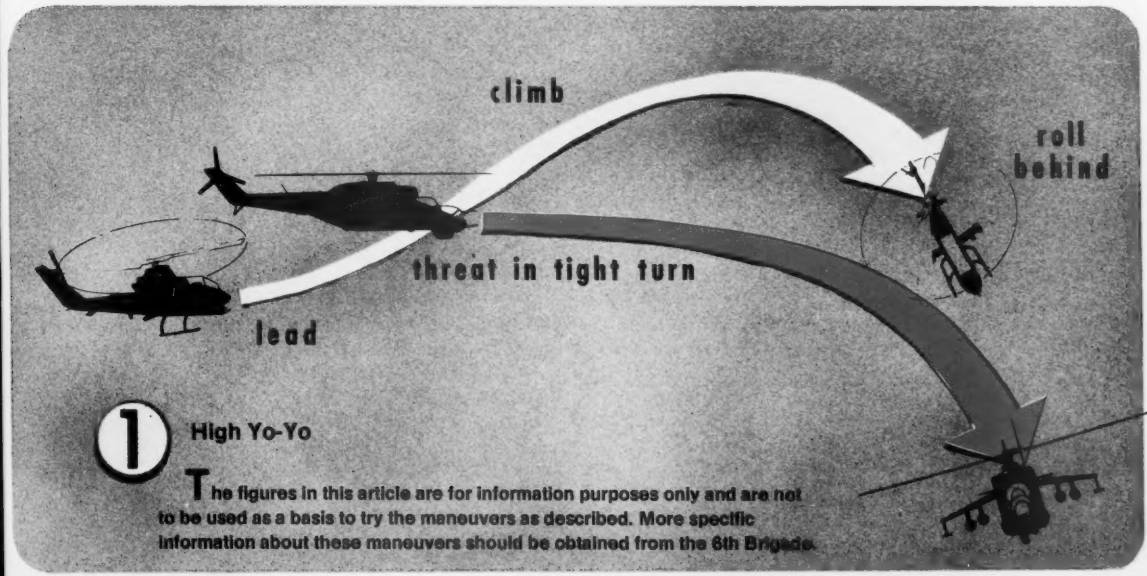
WITHIN THE PAST few years the Army Aviation community has been faced with the growing threat of Soviet rotary wing aircraft. These formidable aerial weapon platforms pose a serious threat to Army Aviation units because an air-to-air mission now seems to be accepted as viable by Soviet rotary wing aviation units. As Soviet Colonel M. Belov has noted in a recently published article on how to fight helicopters, the best way to destroy the armed antitank helicopter is to use another helicopter, a fighter helicopter, armed with cannon and air-to-air missiles, completely dedicated to an antihelicopter mission.

In future conflicts it will not be unreasonable to expect Mi-24E and subsequent variant aircraft to fly forward of their armor columns specifically to engage and destroy our attack helicopters in their holding areas and firing positions. Realizing this potential threat to Army attack helicopter units, the 6th Cavalry Brigade (Air Combat) proceeded with an antihelicopter training program entitled "Helicopter Aerial Combat Week," which took place at Ft. Hood, TX, last December.

The objectives of Helicopter Aerial Combat Week were to familiarize the 6th Brigade's aviators with threat helicopter systems and tactics, recent air-to-air weapon systems developments and helicopters vs. helicopter aerial tactics. Additionally, eight selected AH-1S Cobra instructor pilots were given air-to-air live fire gunnery and actual aerial maneuvers training. These instructor pilots would subsequently pass on this training to the attack helicopter pilots within the 6th Brigade during future training. The training was centered around the participation of two instructor pilots from the Marine Aviation Weapons and Tactics Squadron 1 (MAWTS-1), based at Yuma, AZ, who provided classroom and flight instruction in aerial evasive maneuvers. The Marine Aviation Group 42 (MAG-42) based at Dallas, TX, provided two CH-53 aircraft and crews which simulated threat helicopters during the week's flight training phase. Additional classroom instruction was provided by representatives of the General Electric Company and the General Dynamics Corporation addressing their work in the development of new air-to-air weapon systems.

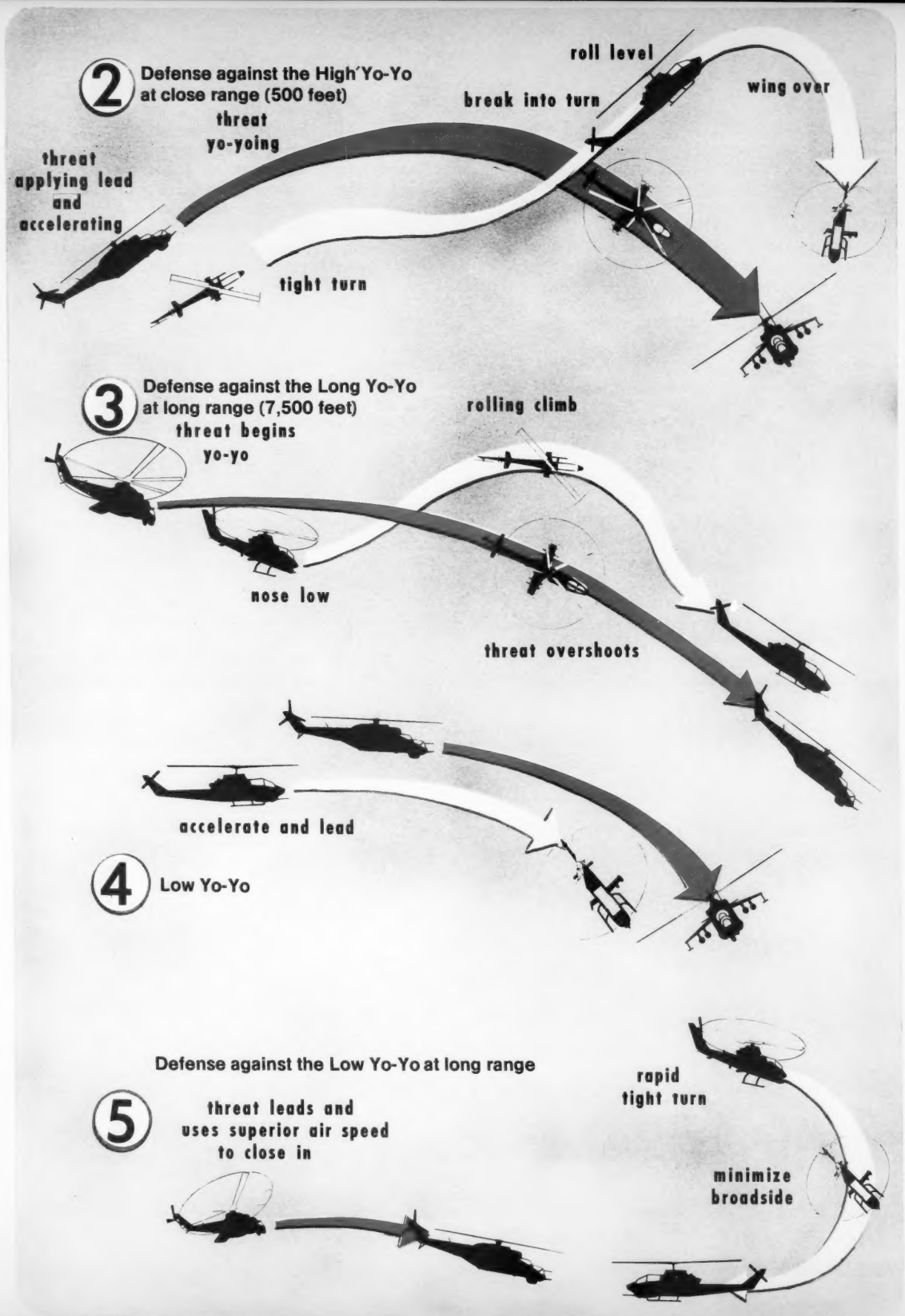
After a brief introduction by COL Charles E. Ivey, the 6th Cavalry Brigade commander, to the industry representatives, Marine instructor pilots and the aviators in attendance, training began with a briefing on one of the most serious aerial threats to tactical Army Aviation—the Mi-24 Hind attack helicopter and its subsequent variants. Here, the capabilities and the tactical employment of the Hind were discussed with particular emphasis placed upon its antihelicopter abilities.

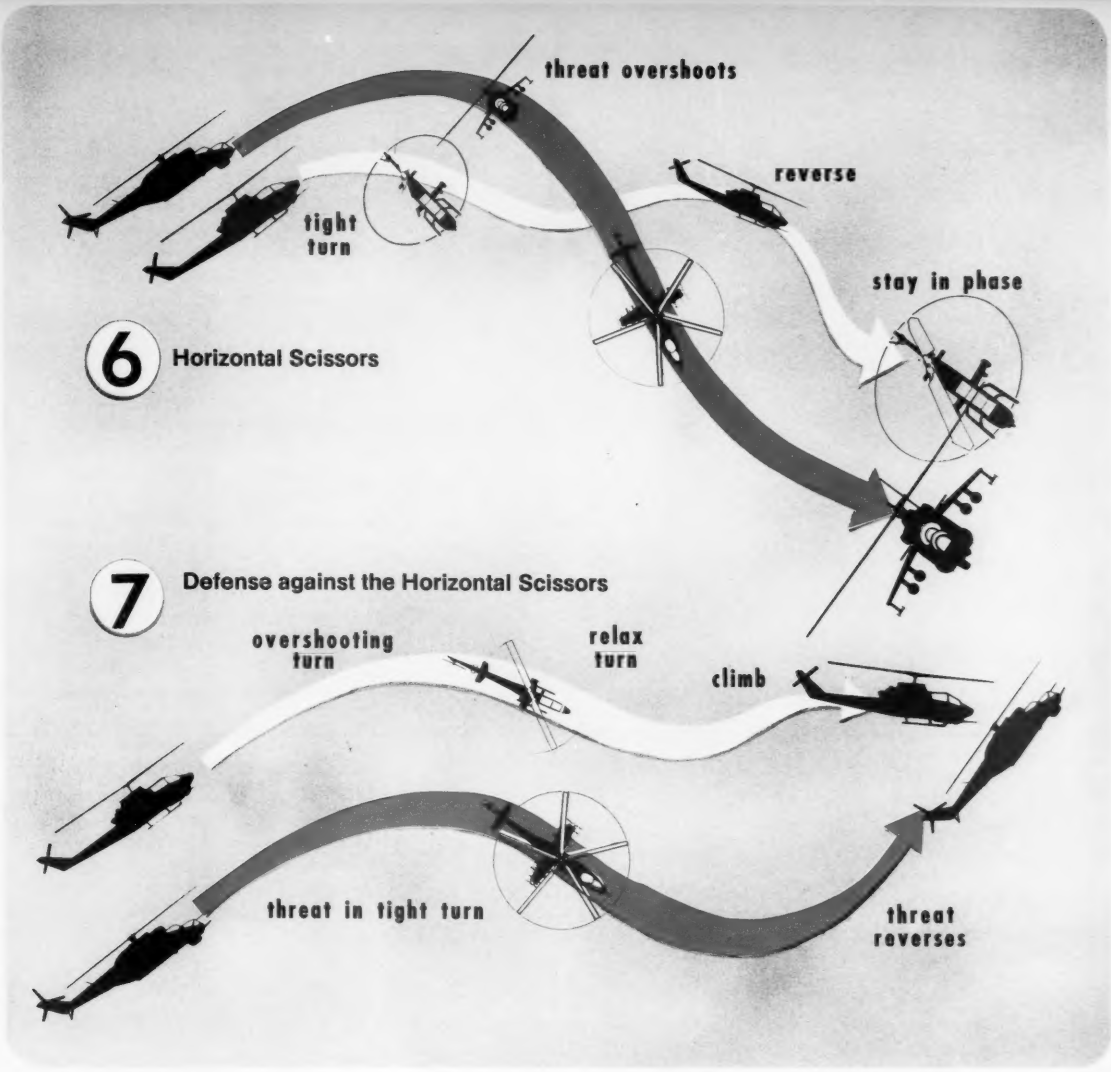
The majority of the day was devoted to reviewing the two primary antihelicopter weapon systems now under development: air-to-air missiles and rapid fire cannon. Mr. Richard Hein of the General Dy-



1 High Yo-Yo

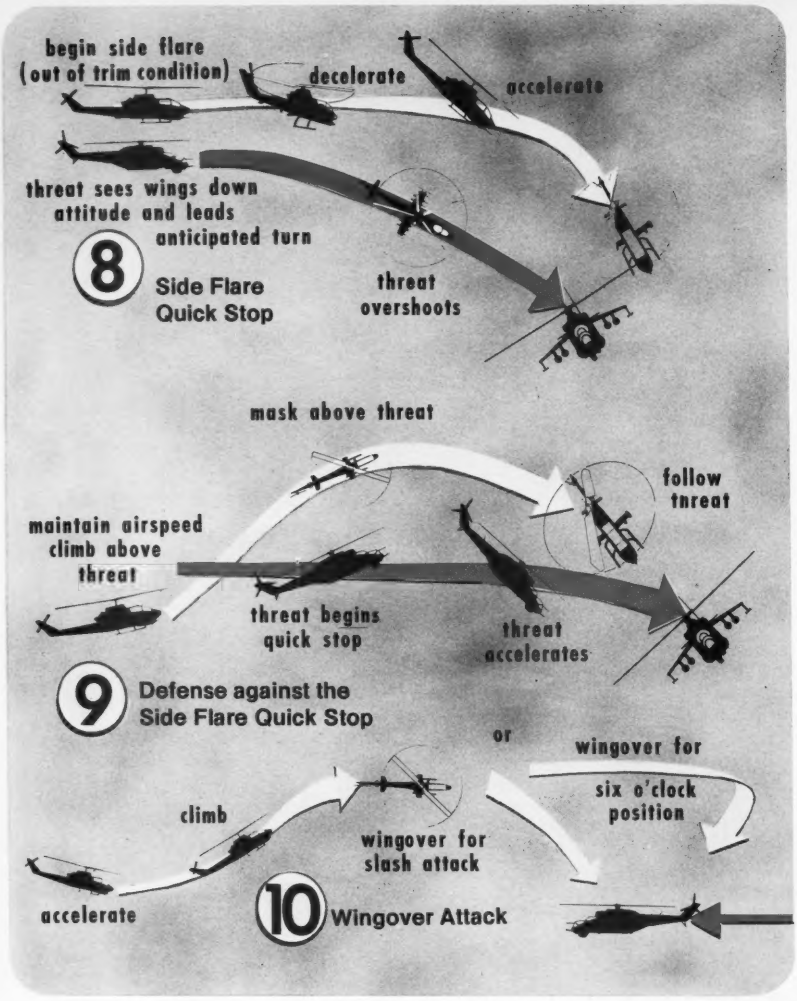
The figures in this article are for information purposes only and are not to be used as a basis to try the maneuvers as described. More specific information about these maneuvers should be obtained from the 6th Brigade.


2
Defense against the High Yo-Yo
at close range (500 feet)
threat
yo-yoing
threat
applying lead
and
accelerating
tight turn
break into turn
roll level
wing over
3
Defense against the Long Yo-Yo
at long range (7,500 feet)
threat begins
yo-yo
rolling climb
nose low
threat overshoots
accelerate and lead
4
Low Yo-Yo
Defense against the Low Yo-Yo at long range
5
threat leads and
uses superior air speed
to close in
rapid
tight turn
minimize
broadside



namics Corporation discussed the development and capabilities of the Airborne Stinger system. This missile system, with its high speed and long standoff range, is capable of dealing with both fixed and rotary wing aircraft in a nap-of-the-earth (NOE) environment, and thus does not undermine the primary antiarmor mission of the Army attack helicopter.

However, a missile system has some shortcomings. For example, it has a minimum engagement range, an obvious launch signature and the launch platform must be pointed at the target prior to launch. If a threat aircraft appears within the minimum missile engagement range or if a situation occurs where the threat attacks from the rear or flank quadrants, then a gun system would be the primary weapon. Mr. Thurow Mayhood and Mr. James Wagner of General Electric discussed their various gun systems in use or under development and the problems encountered in engineering a helicopter air-to-air gun system. Mr. Wagner explained that the lethality of an air-to-air cannon is primarily influenced by its rate of fire. As the firing rate increases, so does the probability of hits during a given time period. Projectile size also has a profound influence—the bigger the round, the more kinetic energy with greater catastrophic target damage. Also, a larger round provides a longer engagement range due to greater projectile inertia. However, the rate of fire and gun size must be optimized for the user aircraft, otherwise excessive vibration, weight, recoil and ammunition



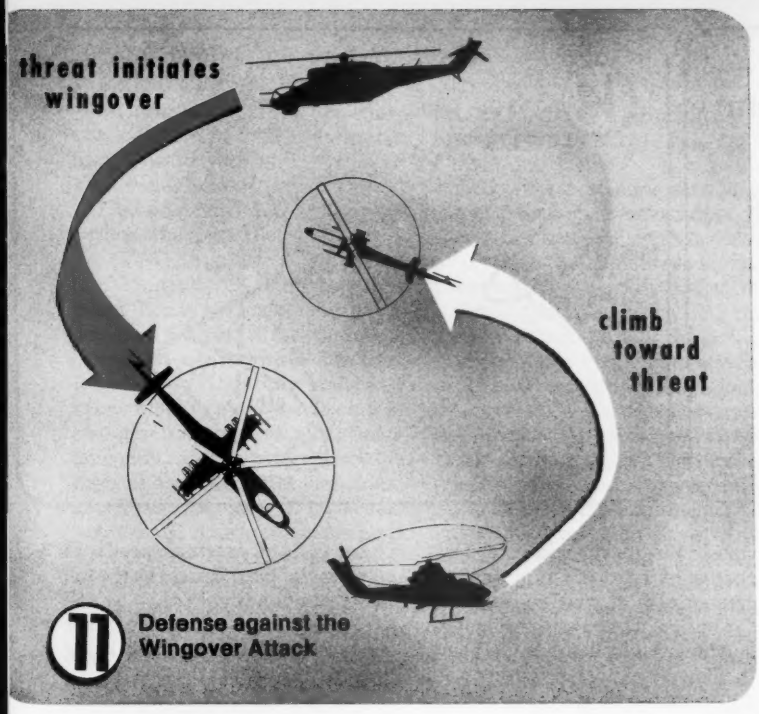
consumption vs. storage capacity would offset the advantages of any particular gun.

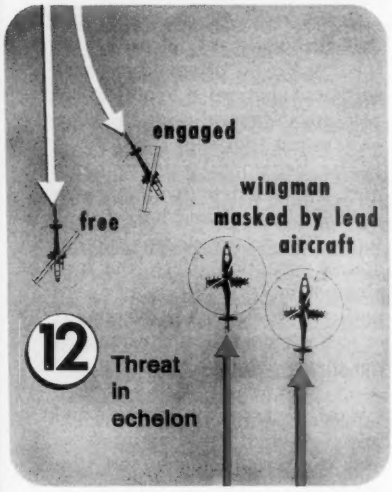
The current M-197 20 mm cannon is considered adequate in dealing with the Hind, and a proposal is being considered to double its rate of fire from 750 to 1,500 shots per minute. The use of the M-134 7.62 mm minigun and the M-128 40 mm grenade launcher was briefly discussed. The M-28 turret weapon system should not be overestimated as a viable air-to-air weapon. Hosing an aerial target with minigun tracers will not produce a great deal of catastrophic damage despite the illusion of a sheet of fire blanketing the target. The long time of flight and high angle of fire of the 40 mm grenade precludes its use as anything but a last-chance, close-in weapon. In engagements which are close enough to use guns, both aircraft would be maneuvering violently, making deflection and lead estimation very difficult (particularly for the 40 mm).

A general consensus, therefore, is that a combination of a missile and gun system would be the best arrangement since each complements the other. A fire-and-forget guided missile such as the Airborne Stinger would be the primary air-to-air weapon, allowing the attack helicopter team to engage threat aircraft at long ranges and yet continue their primary mission of destroying armored targets. In those instances where helicopters are decisively engaged at close ranges, then a gun system would be necessary.

In order to provide the 6th Brigade's instructor pilots with some experience in the difficulties in engaging aerial targets, a firing excercise against MRCAT (miniaturized radio controlled aerial target) trainers was planned for the second day of training. The MRCAT is a styrofoam model airplane with a 6-foot wing span originally designed as an air defense aerial target. Its nimbleness makes it a worthy adversary for a high speed ground gun system, and it was hoped that it would be an adequate aerial gunnery target.

Eight AH-1S helicopters (four Modified S models with the M-28 turret system and four ECAS (Enhanced Cobra Armament System) models with the M-197 20 mm) were used during the firing exercise. All of the AH-1s were to fire on the MRCAT individually with the Modified Cobras engaging initially from a hover followed by the ECAS aircraft using running fire in a tail chase. These scenarios were selected due to range restrictions, yet they offered each instructor pilot the opportunity to engage targets in at least two different types of firing situations. Each instructor pilot would occupy both the gunner's and pilot's station once during the day and would have the option of using any sight system: the TSU, helmet sight or the M-73 sight in the stowed gun mode. It was hoped that a consensus could be arrived at as to the preferred firing techniques following the day's training. Six MRCATs were used and they proved to be a great disappointment. Only two flew long enough to be shot at



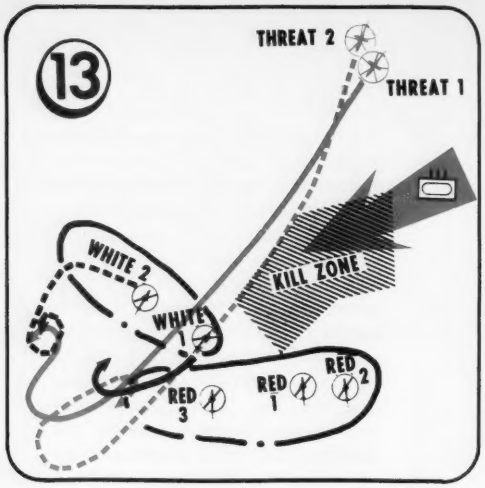


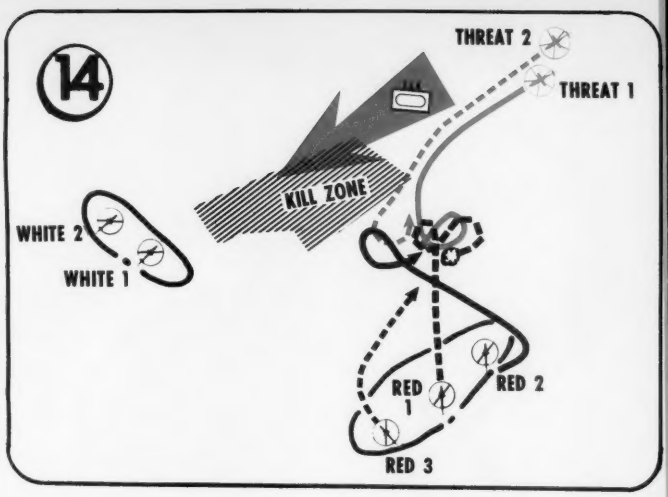
and due to uncontrollability all six trainers eventually crashed out of control, with FM radio interference suspected as the culprit. As a result, training was curtailed for the day. The MRCAT's usefulness as an anti-helicopter gunnery trainer is probably negligible because of its control problems and the fact that it cannot exceed 80 knots of forward air speed. A more plausible solution would be the use of a QH-50 helicopter drone towing a 4 foot by 8 foot cylindrical sleeve. One of these drones could be issued to each installation range control agency with a permanently assigned operator and used as necessary by the aviation units stationed there.

Wednesday morning was devoted to classroom instruction on aerial tactics and maneuvers that have been developed by the Marine Corps. Major Henry C. Perry and Captain Lou F. Russo from MAWTS-1 were the primary instructors and provided cockpit instruction later in the week. Major Perry and Captain Russo are Marine instructor pilots who are qualified in the AH-1J, S and T model Cobras and are the Marine Corps primary air-to-air helicopter instructors.

Major Perry began by outlining the development and growth of helicopter air-to-air training from the initial studies showing a need for such training to the current required air-to-air training for all Marine helicopter pilots. He then addressed the series of EVM (evasive maneuvers) training that would be practiced on the final 2 days of the week. Initially one vs. one maneuvers with similar aircraft (AH-1 vs. AH-1) would be flown, followed by more complicated scenarios, referred to as "set-ups" by the Marines, involving two vs. one and two vs. two using dissimilar aircraft (in this case AH-1S vs. CH-53). The primary training points were to turn the situation to one's advantage by unpredictable maneuvering and the use of teamwork. Major Perry stressed that airspeed is paramount in maintaining a "high energy state" for abrupt maneuvering. However, air-to-air combat between helicopters is not an aerobatic contest involving loops, rolls and Immelmann turns. It is violent and short-lived with each engagement lasting less than 30 seconds before someone is shot down or contact is broken. Each of the individual one vs. one maneuvers was discussed in depth with the 6th Cavalry Brigade's instructor pilots, in preparation for Thursday's flight training.

After preflighting the aircraft that would be used on Thursday's flight training, the involved aviators, cover ship crews, instructor pilots and Marine CH-53 pilots met for a safety briefing. Here the rules of engagement, aircraft separation, airspace management and the all-important "knock it off" call were briefed. The "knock it off" call was perhaps the most critical safety control measure used while conducting aerial evasive maneuvers training. If at anytime anyone who was involved with the training saw an unsafe situation or felt that the degree of maneuvering was exceeding his own limitations, the "knock it off" call would be given. Upon the call, all maneuvering aircraft would immediately resume straight and level flight and would clear the maneuvering area. One point to be





stressed is the importance of having all friendly and aggressor pilots coordinate face to face whenever evasive maneuvers training is conducted. Altitude restrictions that were imposed were from a minimum 100 feet above ground level (AGL) to a maximum of 1,000 feet AGL.

Major Perry and Captain Russo occupied the AH-1's gunner's seats while the 6th Brigade instructor pilots flew in the pilot's station during both one vs. one and two vs. two set-ups. The Marine instructor pilots would first demonstrate each maneuver emphasizing certain key points or techniques, then allow the Army pilots to practice, with each period lasting about 1 hour.

The flight period began with flat tail chases which allowed the pilots to judge closure rates at different airspeeds. Turns, climbs and descents were then added as the period progressed. The actual set-ups followed, beginning with both AH-1Ss approaching head on, each then breaking to the left and "corkscrewing" upward in an attempt to get on the other's tail or 6 o'clock position. A point to be stressed here is that continuing to do so would eventually have both helicopters at altitude, out of airspeed and executing pedal turns. Equally important was that after about 20 seconds the learning value of each set-up would diminish and, as discussed previously, that the time period roughly corresponds to the approximate duration of most actual engagements.

The first of the evasive maneuvers taught was the High Yo-Yo (figure 1). This technique is used to prevent the overshooting of a threat aircraft while in pursuit. Here, the pursuing aircraft uses speed and lead angle deflection to close in as the target initiates a defensive break. Once the threat aircraft reveals the direction of its break, the pursuing aircraft climbs, trading airspeed for altitutde, avoids an overshoot and then rolls into the threat's rear.

To defend against the High Yo-Yo at close range (500 feet or less), break toward the threat and force him to overshoot. Before turning so far as to lose visual contact, roll wings level and use a wingover attack to force the threat low (figure 2).

If a greater separation exists (500 feet or longer) initiate a nose low attitude and then begin a defensive pull-up with a rolling climb which will cause the threat to overshoot at a lower altitude (figure 3, Long Yo-Yo).

The Low Yo-Yo was the next maneuver taught. It is an offensive maneuver that exploits the 6 o'clock position by decreasing range and increasing closure rates. To initiate this maneuver, lower the nose to increase airspeed and lead into the threat's defensive turn. As the range closes, trade off excess airspeed with a cyclic climb to reestablish the tail chase position (figure 4).

Countering the Low Yo-Yo is accomplished by turning and diving toward the threat at the first indication of its turning and force a head-on pass. Beware! The Hind has bullet-resistant forward windscreens and we don't. Another technique that can be used as a defense against the Low Yo-Yo, provided you have sufficient airspeed, is to pull up and roll into the threat using the wingover attack (figure 5).

The Horizontal Scissors came next. This is a defensive maneuver used if airspeed and nose to tail separation do not permit another course of action. Here, the lead element increases its rate of turn until the threat either overshoots or moves outside its turn radius. As the threat passes, reverse the previous direction of turn and slide toward the threat. Once behind and below, attempt to remain in phase with the threat's maneuvers (figure 6).

To counter the Horizontal Scissors, do not attempt to turn harder inside the threat's turn radius or reduce power. Relax the turn to maintain airspeed, climb and wait for the threat to reverse and cross in front (figure 7). This will establish you in a position to initiate a tail chase and employ weapon systems

in a more stable plane. If by some chance the threat fails to reverse back toward you, initiate a High Yo-Yo and break contact.

The side flare quick stop was perhaps the closest relating maneuver to NOE flight techniques that the Marines taught to the brigade's pilots. This is a defensive maneuver designed to cause the threat to overshoot when within 500 feet. Rapidly apply opposite pedal and cyclic input to place the aircraft in an out-of-trim condition while simultaneously reducing power. Once the threat is committed to an overshoot, accelerate, maneuver to a tail chase position and close to within weapons' parameters. If you become the victim of the threat's use of the side flare, maximize your higher energy state and initiate a rapid climb to mask your aircraft from the threat's weapon systems. In doing so, you place the threat's rotor disk between his turret weapons and your aircraft and this in turn leaves you in a position to initiate a look down attack (figures 8 and 9).

The wingover attack was then demonstrated. This is an offensive maneuver that is used primarily in head-to-head engagements or slightly angled off the front of the threat (figures 10 and 11). To initiate this maneuver accelerate toward the target at high speed. As the distance closes initiate a rapid cyclic climb (25 to 30 degrees) to attain an altitude advantage over the threat and mask his weapon systems. As you reach the desired altitude roll in toward the threat by letting the nose of the aircraft fall below the horizon while maintaining positive G loading. Dive for a point about one-half the distance between your position and the threat's position over the ground and close to weapons' parameters. If this slashing attack is not desired simply dive into the tail chase position to engage.

To defend against the wingover attack, climb and turn toward the threat after its commitment to a nose low attitude. This generally results in the two aircraft corkscrewing in an effort to gain the 6 o'clock position.

Following these basic aerial maneuvers, each of the instructor pilots was given a free style set-up in which to practice the maneuvers he had been taught, with the Marine instructor pilots still occupying the gunner's seat controlling the action.

From these maneuvers several conclusions became apparent. Cockpit coordination is an absolute necessity. Common terminology and the prior division of cockpit duties (clearing for turns, weapons utilization, monitoring instruments, visual acquisition, etc.) have to be addressed prior to each flight. Aircraft control is paramount to avoid exceeding crew and aircraft limitations. Transient torque and pitch cone coupling were very prominent considerations but can be adequately dealt with provided that a sufficient amount of practice is made available. During these violent engagements the participating aircraft will be flying very close together thus making the gun the primary weapon. The AH-1S with its helmet sight system and turret mounted guns has the advantage over threat aircraft with fixed weapons or those systems that require the gunner to bury his head in a sighting device. This weapon sight advantage is offset, however, by the AH-1S's poor rearward visibility. An MWO (modification work order) is needed to install two rearview mirrors on either side of the pilot's station, perhaps incorporating a combination of convex and flat mirrors in an aerodynamic fairing. This will greatly increase the field of view of the pilot and aid in overall tactical awareness.

Once each instructor pilot had the opportunity to fly one vs. one and felt comfortable with the basic maneuvers, two vs. one and two vs. two set-ups against CH-53s commenced. The MAG-42 pilots have been trained in evasive maneuvers and have had previous experience simulating threat tactics against Army and Marine aircraft.

Flying against dissimilar aircraft added a great deal of realism to the flight training. The CH-53's agility belies its great size, and its superior airspeed and acceleration make it an excellent threat trainer. When operating without cargo, the CH-53's performance and power reserves closely resemble those of many threat helicopters.

The set-ups began with the aircraft approaching head-on. The CH-53s would maneuver in a tight echelon or "welded wing" formation that is normally employed by Soviet attack helicopters. After the initial head-on pass and right break, each team would maneuver in an attempt to force a two on one engagement. Here the main emphasis was to determine which AH-1S was "engaged" and which was "free." Major Perry had stressed in his classroom instruction that this determination was crucial to successful team engagements. The engaged and free aircraft had specific role responsibilities:

Engaged Role Responsibilities

- Keep the threat in sight
- Remain unpredictable
- Deny weapons employment
- Force the threat to lose sight
- Clear own 6 o'clock position

Free Role Responsibilities

- Track the engaged aircraft and the threat
- Clear the engaged aircraft and own 6 o'clock position
- Maintain a high energy state
- Break phase (contact) with the fight

As the aerial engagement progressed the free and engaged aircraft had to be prepared to change roles. As maneuvering intentions and threat positions were called out, the free aircraft maneuvered to prevent the engaged aircraft from reaching a low energy state or allowing the threat to get at his own 6 o'clock

position. As a result, in the two AH-1Ss vs. one CH-53 set-up, the threat was unable to press an attack on the engaged aircraft without becoming vulnerable to the free AH-1.

In the two vs. two set-up with the threat aircraft in echelon, the AH-1s would maneuver so that the engaged element would be always on the threat's weak side, thus causing the lead threat to mask his wingman (figure 12).

Meanwhile the free element would maneuver to direct the engagement, either forcing a disengagement or driving the fight. A disengagement could be accomplished by forcing the threat aircraft to lose sight through terrain masking or through the use of shadow. If the free element must drive the fight he should then maneuver to cause an engagement by supporting elements (friendly air defense, A-10s) or force the threat aircraft into a disadvantageous position. Beware however, because in a matter of seconds the situation can reverse itself which emphasizes the need for teamwork and the need to keep a close eye on all threat aircraft. Finally, both crews must avoid "padlocking" or target fixation on the same threat. The one you don't see is the one that kills you both!

The week's training culminated with two iterations of attack team battle-drill on Friday afternoon. A 3 × 5 mix was briefed on a battlefield situation where an enemy armored regiment had forced a breakthrough of friendly lines and was threatening the ground units' rear areas. The crews were also briefed to be aware of threat air elements that could be operating in the area. Since the attack team knew an aerial threat existed they were briefed to attempt to avoid an aerial engagement unless actually fired upon by other aircraft. If the team was forced into an aerial engagement, then the fewest possible attack helicopters were to engage in order to minimize the disruption of the primary mission. The scout helicopters were briefed to provide security in the battle position and to alert the attack helicopters to the presence of any threat aircraft.

Immediately following the flight briefing, the aircraft were launched and proceeded to their respective holding areas and subsequently into their firing positions.

As the team began to engage the simulated armor column, two CH-53s which were orbiting north of the battle area were called in by the cover/control aircraft to attempt to locate and engage any attack helicopters in the area. As the CH-53s came within visual range (4 km) they were spotted by the white (light section) scout who called out to the battle captain the heading and number of aircraft inbound. The flight techniques employed by the CH-53s made it possible to quickly determine which section of the attack team would be engaged. The white team was then released by the battle captain to engage the CH-53s to protect the red team elements. As the map in figure 13 shows, the white 2 element immediately exited his firing position to gain airspeed and attack to engage while white 1 remained in his hover hole to attempt a concealed passing shot on the lead threat. White 1 fired on the lead CH-53 at about 200 meters, pivoting with the target as it passed through the firing position and then exited to the rear to gain airspeed and support white 2. Finally white 2 was spotted by the second CH-53 pilot who immediately executed a Low Yo-Yo to force a head-on engagement. As the two aircraft passed each other at 100 feet above the trees, both aircraft executed high banked turns with the Cobra coming out to the CH-53's rear. This iteration lasted less than a minute from the first visual contact to the "knock it off" call.

After the engagement the 3 × 5 mix withdrew to a holding area to reorganize, then proceeded forward to reengage the advancing armor force. As the attack helicopters began to fire on the tank column, the scouts again sounded the alarm. Two CH-53s approached from the northwest in an attempt to disrupt the team's flank. This time the red or heavy team was engaged and as in the first iteration, the fight lasted less than a minute.

As the map in figure 14 illustrates, the red team took a more aggressive course of action. Red 1 (the overall Cobra leader) moved out directly toward the threat in order to establish airspeed and provide the CH-53 with the smallest visual profile. This proved to be very hazardous and resulted in red 1's simulated destruction by the lead CH-53 who had visual contact with him early in the battle. Meanwhile red 2 and 3 exited their hover holes using terrain masking and low level flight to gain maneuvering airspeed. This allowed red 2 and 3 to pick their fights and saved the situation for the red team following red lead's unfortunate demise.

Both iterations showed the value of the OH-58 scouts in an air-to-air engagement even though still unarmed. In both instances their early visual acquisition (often in excess of 5 km) gave the attack helicopters a distinct advantage. This allowed the attack team to initiate maneuver in order to engage the aerial threat and thus prevented the complete disruption of the antitank mission. Although not allowed to maneuver against the CH-53s, the scout's presence in the battle area was a visual distraction to the CH-53 pilots who initially have a difficult time trying to locate *any* helicopter down in the trees.

Helicopter Aerial Combat Week introduced many new concepts to the aviators of the 6th Brigade. It was discovered that energy (airspeed) or the lack of it is one of the most critical keys to survival. Since the primary mission of the Army attack helicopter is to disrupt and destroy enemy forces as a member of the combined arms team, and

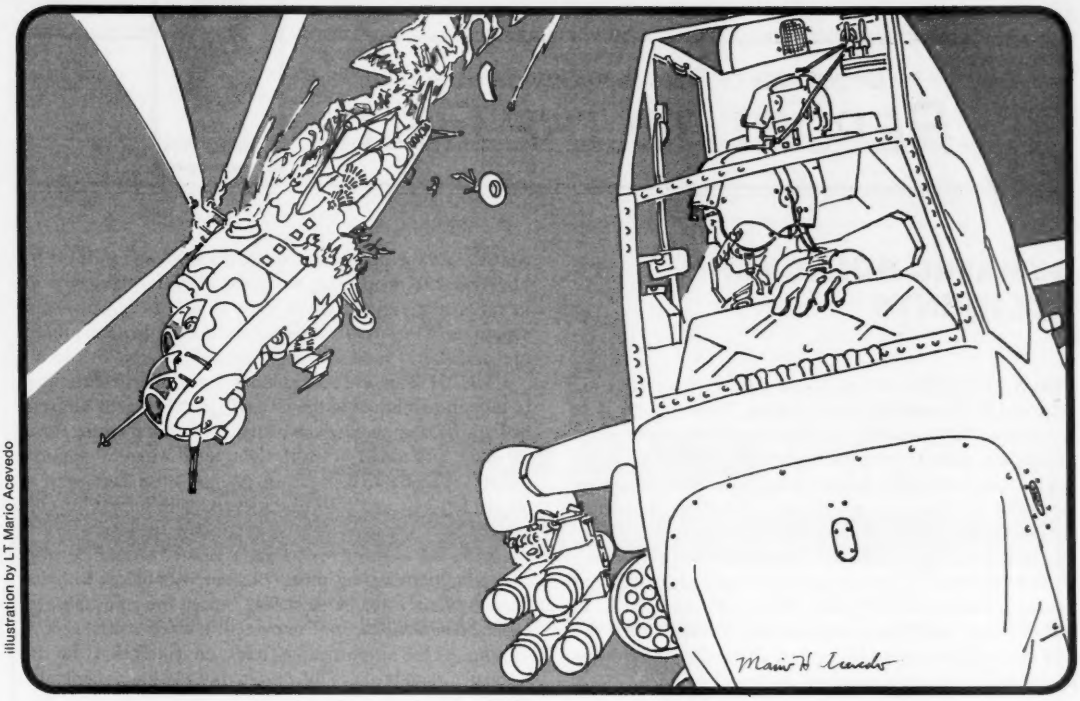


illustration by LT Mario Acevedo

since we do not as yet have an air-to-air missile system in operation, remaining undetected is the preferred method of air defense. However once committed, cannon fire and maneuver must be used to ensure survival. Keeping your eyes open and making the first visual contact with an approaching aerial threat provide the opportunity to initiate this maneuvering and gain the tactical advantage.

For any air-to-air training, qualified instructor pilots and trained and proficient aggressor crews flying dissimilar aircraft are a must. Equally important is a well organized and carefully thought out training sequence. Safety considerations were an initial concern but if adequately briefed and controlled, air-to-air training can be conducted well within existing safety parameters.

A training team organized along the same lines as the MAWTS-1 group should be formed to train all of the Army's instructor pilots in the techniques of air-to-air combat. By training the trainers at one central location, the U.S. Army Aviation Center could simply and inexpensively provide standardized instruction and spread a wealth of experience throughout every aviation unit in the Army. Coupled with effective tactical doctrine, which is now under development, Army Aviation can meet and destroy the aerial threat on any battlefield.

During the 1973 Mideast War those helicopters that did nothing when engaged by an aerial threat were annihilated; those that maneuvered agressively, *including heavily-laden transports*, survived. All Army aviators should be proficient in air-to-air combat if we are to not only survive but also drive the battle to a successful conclusion.

Helicopter Aerial Combat Week gave the aviators of the 6th Cavalry Brigade a valuable insight to the complexities of air-to-air combat—a new skill in the myriad of tasks we must master to defeat the threat.

ABOUT THE AUTHORS

Captain Greg R. Hampton was commissioned in Armor upon graduation from ROTC at Colorado State University in 1977. His service has included duty as a mechanized infantry platoon leader, weapons platoon leader and tank platoon leader while assigned to the 1st Cavalry Division. Following his completion of the rotary wing aviation course as an honor graduate, he was assigned to the 6th Cavalry Brigade and has served as a scout and attack helicopter platoon leader. He is now the operations officer for A Troop, 4th Squadron, 9th Cavalry, 6th Cavalry Brigade (Air Combat).

First Lieutenant Mario H. Acevedo was graduated from New Mexico State University in 1978 with a B.S. in mechanical engineering. He was commissioned through ROTC into the Infantry and served as a rifle platoon leader and heavy motor platoon leader with 7th Infantry Division at Ft. Ord, CA. 1LT Acevedo is currently serving as an attack helicopter platoon leader with the 6th Cavalry Brigade (Air Combat), Ft. Hood, TX, and worked as the assistant project officer for Helicopter Aerial Combat Week.

DYNAMIC ROLLOVER ACCIDENTS

FROM JANUARY 1972 to January 1982, Army Aviation recorded 25 dynamic rollover accidents. The average aviator would most likely identify the cause of these accidents as improperly performed slope operations. However, such is not the case—only eight occurred on slopes and the remainder occurred on level ground. Equally disturbing is the fact that since June 1977 we have experienced a significant increase in this type accident. During this 4½-year period, there have been 17 rollover accidents but only 3 occurred as a result of slope operations. The significant increase in rollover-type accidents is dramatically illustrated by the fact that eight occurred in the past 13 months of the study period and all but one occurred on level ground.

These are accidents that should never have occurred. They involve the most basic of all helicopter maneuvers—the pickup to a hover. This maneuver must be mastered by the fledgling aviator before he can be taught to hover and maneuver for his first solo flight. Furthermore, these accidents have not necessarily been caused by inexperienced personnel. Pilots in command (PICs) with considerable experience, to include maintenance test pilots (MTPs) and instructor pilots (IPs) have been involved in too many instances. We have to be doing something wrong. Here are a few examples to illustrate the problem:

• UH-1H. Pilot was performing a hydraulics check in a high wind condition, without the assistance of the copilot, when the aircraft became light on the skids, began sliding to the right and rolled about the longitudinal axis of the right skid. Corrective action was initiated, but the aircraft continued to roll onto its right side. Both crewmembers were transported to a local medical facility where they were treated for minimal injuries and released.

• OH-58A. Pilot was practicing for the flyoff of the world helicopter competition. He placed the heel of the right skid on the ground, held it there with right aft cyclic, and pivoted around the heel to the right. He attempted to pivot to the left by applying left pedal. The aircraft rolled over on its right side. The crewchief suffered a broken bone in the left hand. Both crewmembers were evacuated to the hospital.

• UH-1H. Aircraft had just completed a limited test flight (once around the pattern) to verify correct antitorque pedal positions and was sitting in the grassy area next to the runway. As the maintenance test pilot began to lift off to hover back to the parking ramp, the aircraft rolled over on its right side and the main rotor struck the ground and separated. The aircraft came to rest inverted and the three crewmembers exited unassisted through the copilot's door.

• UH-1H. This was the student pilot's (SP's) first attempt to takeoff to a hover in the UH-1H aircraft. As the aircraft became light on the skids, it began a slow left pivoting turn. IP was about to correct with right pedal when SP applied abrupt up collective. Aircraft pitched nose high with a severe left yaw and roll. IP corrected with forward cyclic causing 30 to 40-degree nose-low attitude. Subsequent attempt to correct for the nose-low attitude resulted in another nose high condition causing impact of main rotor blades with the ground. Main rotor blade strikes caused the rotor mast to separate and the aircraft impacted in a left roll nose-low attitude. As the aircraft came to rest on its left side, the IP reached up and broke out the cabin roof window to facilitate egress. All crewmembers exited the aircraft through the same cabin roof window.

• UH-1H. SP was attempting an instrument takeoff from a level surface. The SP applied collective pitch abruptly, causing the aircraft to roll to the right. The main rotor blades struck the ground and the aircraft came to rest on its right side. The crew egressed without difficulty and was transported to the hospital, examined and released by a flight surgeon.

• UH-1H. The SP attempted a takeoff to a hover with excessive right cyclic. The aircraft pivoted about the heel of the right skid. A dynamic rollover situation developed with a rapid right roll. Both main rotor blades contacted the ground which caused the aircraft to pitch up to about a 20-degree nose-high attitude. The right synchronized elevator, the tail skid and the tail rotor blades contacted the ground, resulting in loss of tail-rotor thrust and separation of the vertical fin. The IP applied left forward cyclic and lowered the collective pitch full down. The fuselage bounced several times as it yawed 260 degrees to the left, resulting in collapse of the landing gear. The aircraft came to rest upright. The crewmembers exited the aircraft unassisted and were evacuated to the medical facility.

The foregoing illustrations have much in common—all occurred on level ground. The PICs, IPs and maintenance test pilots were experienced aviators. The use of improper procedures was evident in all instances, as was inattention to duties and complacency. Let's put a stop to these silly maneuverings. PICs must not permit themselves the luxury

of day-dreaming while flying and IPs must not cease instructing—not even for an instant. Sufficient information on the dynamic rollover phenomenon is available. Applying this information to a well-organized prevention and training program can produce excellent dividends and eliminate a needless type of aviation accident.

DES welcomes your inquiries and requests to focus attention on an area of major importance. Write to us at: Commander, U.S. Army Aviation Center, ATTN: ATZQ-ES, Ft. Rucker, AL 36362; or call us at AUTOVON 558-3504 or commercial 205-255-3504. After duty hours call Ft. Rucker Hot Line, AUTOVON 558-6487 or 205-255-6487 and leave a message

CONNECTION

ACTAAT

Aviation Center Training Analysis and Assistance Team

EQUIPMENT REQUIREMENT

ISSUE: The following equipment items are considered priority needs by air traffic control (ATC) personnel to provide the capability required for their mission:

a. Very Light Air Traffic Management Equipment (VLATME) is needed as an interim theater and corps device. A lightweight, low signature, surveillance radar is required as a follow-on, with short fielding times.

b. An automated system is needed with the capability to monitor and positively control all aircraft positions and destinations.

c. A directional beacon system that is simple to operate and maintain, is nonjammable, has a low signature and will interface with the new aircraft navigation and positioning equipment (i.e., Doppler).

d. A means for ATC interface with the Position Location Reporting System (PLRS)/Joint Tactical Information Distribution System (JTIDS). What actions are ongoing or anticipated to provide ATC with these capabilities? What is the current doctrinal needs assessment for ATC capabilities in these areas?

COMMENT: Many of the requirements outlined here are discussed in the United States Army Communication Command (USACC) draft Letter of Agreement (LOA) for the Combat Support Air Traffic System (CATMANS), dated 20 July 1981. A Joint Working Group (JWG) was convened 24 and 25 August 1981 to discuss this LOA. The LOA addressed many of the priority needs identified in this issue. However, VLATME is not being considered as anything more than a training device in Europe. There are no plans to develop a new directional beacon. In fact, the TRN-30, Nondirectional Beacon and Associated ADF Airborne Receivers, will be phased out in the 1990 to 1995 timeframe. Though the other equipment needs were addressed in JWG, further staffing will be necessary to determine the best system to install in Army aircraft. As of this date no decision has been made. POCs for ATC related questions are: Mr. Joe Swartz, AUTOVON 879-6793 or CPT Charles Kennedy, AUTOVON 879-6920 (USACC, USA Air Traffic Control Activity, CCQ-SYS-CD, Ft. Huachuca, AZ 85613).

REPORTING FINAL

Late News From Army Aviation Activities

Chief Warrant Officer, CW3, Robert A. Stolworthy checks out the instruments and communications in a UH-1 Huey helicopter at Ft. Rucker, AL, before a flight, trusting this one will not in anyway be similar to one he made in December 1976 at Ft. Hood, TX. That earlier flight was the basis for an article, "From Routine to Near Disaster," which was the May winner of the *Army Aviation Digest* Monthly Writing Award. He wrote that many things went wrong during the annual instrument renewal checkride, including rapid deterioration of weather conditions, "... but the biggest problem we had was the malfunction of our communication gear." CW3 Stolworthy received a Certificate of Achievement from the *Digest* and an engraved pen from the Bogardus S. Cairns Chapter, Association of the U.S. Army. He is now a standardization flight instructor pilot at Lowe Division, Ft. Rucker, and was a member of the 1981 World Helicopter Championship Team.

FROM FORT RUCKER

Guest Speakers:

• Major Sherwood C. Spring, an Army aviator who is now a qualified space-shuttle pilot with the National Aeronautics and Space Administration, told 80 graduating helicopter pilots they will have "a tremendous opportunity to work with some of the finest technological equipment going." Those opportunities can exist in the space program for his listeners because the professional abilities Army pilots have is a good qualification for selection as shuttle "mission specialists."

• Brigadier General Ellis D. Parker, Army Aviation officer and deputy chief of staff for operations, Department of the Army, Washington, DC, challenged 29 graduates of the Aviation Officer Safety Course to be leaders in the safety field and to place high safety standards on their units. He said they will have a very important position in their units because "establishing safety guidelines and adhering to them will prevent accidents."

• Lieutenant General Jack V. Mackmull, commander of XVIII Airborne Corps, Ft. Bragg, NC, spoke at a recent general membership meeting of the Bogardus S. Cairns Chapter, Association of the U.S. Army. The corps he commands is the Army portion of the Rapid Deployment Force and makes heavy use of aviation to carry out its mission. "I am probably the Army's largest user of aviation in a single command," he said. "We have 750 to 800 aircraft to do our basic mission."

(USAAVNC PAO)

FROM FORT HUACHUCA

Gives Flight Assistance. SP5 Tami L. Cockerton, an Army air traffic controller on duty with the Federal Aviation Administration facility at Niagara Falls International Airport, NY, has been credited by the FAA with a flight assist:

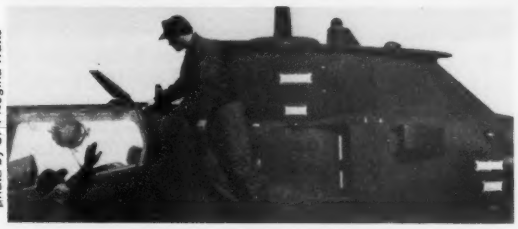
A student pilot unfamiliar with the area around the airport asked for landing directions. He was told to contact Buffalo Approach Control but that facility could not identify the airplane because of limits in the airplane's instruments.

An FAA controller relieved SP Cockerton at her local control position while she looked for the airplane. She also helped the pilot locate familiar geographic features. After about 15 minutes, she was able to see the airplane and assist the pilot to make a safe landing.

SP Cockerton's normal Army duty station is Yuma Proving Ground, AZ. She is an Army communications command controller on loan to the FAA. **(USACC PAO)**

Chief Warrant Officer, CW3, Michael B. Farmer tests the aviator's night vision imaging system (ANVIS) before a night-firing exercise in the AH-1S (Modernized) Cobra at the Army Aviation Development Test Activity (AVNDTA), Ft. Rucker, AL. The ANVIS is the third generation of night vision goggles and is designed specifically for aviation as a replacement for the AN/PVS-5 goggles. AVNDTA is one of nine installations and activities under the Army Test and Evaluation Command which checks the developmental quality of proposed Army materiel throughout the United States and in the Republic of Panama.

photo by SP4 Regina Watts



Major George Magrath (right) and William H. Grady of the Army Aviation Development Test Activity (AVNDTA), Ft. Rucker, AL, inspect an upper wire cutter on the AH-1S Cobra helicopter. Using a modified OH-58 lower wire cutter as the prototype, controlled testing will determine if the proposed location and configuration will interfere with navigation and VHF/FM homing.

photo by Pat Robbins

A British Auster MK-9 aircraft (left) has been reassembled and is now on display at the Army Aviation Museum, Ft. Rucker, AL. The Auster arrived aboard a British C-130 Hercules from the Museum of Army Flying at the Army Air Corps Centre, Middle Wallop, Hampshire, England, in exchange for a U.S. Army L-19 (0-1) (right), with each of the aircraft having a 99-year lease on its new home. The Auster MK-9 was used by the British Army in Korea. In its original version, designated as the MK-1, it served in 1941 as an artillery observation aircraft.

FROM PORTUGAL

Safety Course Scheduled. An international course on Aviation Safety Management will be taught 18 to 29 October 1982 in Lisbon. It is to be presented by the Institute Superior Engineering, Lisbon, in cooperation with the Institute of Aviation Safety, Stockholm, Sweden, and will be sponsored by TAP Air Portugal. For reservations contact Flight Safety Department, TAP Air Portugal, Annexo F Hangar 6 Room 22 Floor 3, Post Office Box 5124, P 1704 Lisbon CODEX, Portugal.

Correction

Major General John W. Woodmansee was erroneously carried in the June issue of the *Aviation Digest* as having served as commanding general, V Corps, USAREUR. He was deputy commanding general, V Corps, USAREUR, before assuming command of the 2d Armored Division on 22 June at Ft. Hood, TX.

PEARL'S

Personal Equipment And Rescue/survival Lowdown

Elaine Chiboucas photograph by Tom Greene

Kudos are in order

1LT Max Mitchell and SSG Michael Bulkley of the Aviation Company, 5th Aviation Battalion (P), Ft. Polk, LA 71459, were recently visited by the Health Services Command Aviation Resource Management Survey (ARMS) Team and the following report was rendered by the Inspector: "The Aviation Life Support Equipment (ALSE) Shop of the Aviation Company, 5th Aviation Battalion, clearly indicated that the ALSE officer and NCOIC had truly done a most outstanding job. Undoubtedly their ALSE program is a prime example of how a program should be developed and implemented." PEARL was elated to receive this report and appreciates their outstanding effort as do others in the ALSE community.

Exception Requisition – AN/PRC-90 Survival Radio

The turn-in of subject radio to Sacramento Army Depot for repair has heretofore resulted in long turnaround of the item. We have discussed this problem with Mr. Jim Lewis, the Communications-Electronics Command (CECOM) item manager, AUTOVON 992-3919. He has assured us that the repair/replacement of the radio can be speeded up by simply identifying on the requisition that it is an "EXCEPTION REQUISITION" for a serviceable radio. The turn-in document number should be cited and a code "26" should be inserted in columns "55" and "56" of the requisition document. Accompishing these actions will preclude requisitions being placed on back order from activities with a low Department of Army management priority.

TC 1-62 And FM 1-302

We are still getting questions pertaining to items erroneously listed with wrong national stock numbers in TC 1-62. "Correct" NSNs for items listed are as shown herein: AN/PRC-90 survival radio 5820-00-782-5308; AN/PRC-90 antenna 5820-00-371-6806LS; test set TS2530A/UR - 6625-00-238-0223; test set AN/PRM-32A 6625-01-013-9900.

FM 1-302 is currently out for coordination, and eventually will replace TC 1-62. Another FM for maintenance, repair and inspection of ALSE is being prepared by the ALSE Training School at Ft. Eustis, VA. FM 1-302 covers aviation life support equipment for Army aircrews primarily in the operations area and was prepared by the U.S. Army Aviation Center, Ft. Rucker, AL. These documents are but another step in providing to the Army Aviation community information and instructions pertaining to this critical equipment.

ALSE Activities

The Fifth U.S. Army recently completed another "hands-on" ALSE school at San Antonio, TX. About

93 Army Reserve, Army National Guard and Active Army personnel were given instruction in such subject areas as establishment of a unit life support shop; ALSE publications; inspection and maintenance of the life preserver, first aid kits, individual survival kits, flight clothing, flight helmet, survival vest, survival radio and ALSE maintenance forms and records; also covered was the ALSE retrieval program. A highlight of this training was an overnight training exercise where the "students" got a taste of survival under "survival" conditions. Mr. Al Cargen of the Fifth Army Safety Office and his instructors should be given an accolade of thanks for their fine performance of duty. Unfortunately for the Army Reserve, Mr. Cargen is leaving for an assignment with the Army National Guard at Aberdeen, MD. Thanks for a fine job Al, and we know you will continue the fine ALSE support wherever you go. We will certainly miss you.

ALSE School Update

Ft. Eustis, VA, continues to train Army personnel at their newly organized ALSE school. Recently, the ALSE Management Steering Council convened at Ft. Eustis, and had an opportunity to see the "hands-on" training that was being conducted. We also participated in the students' ALSE graduation ceremonies. Quotas for this training are available through your local training officers and major commands. We are still working toward a career management field for ALSE and we will keep you posted via these PEARL articles.

Helmet, Flyers, SPH-4

Army activities have reported receiving subject helmets manufactured by AQUA-AIRE under Contract No. DLA 100-80-C-2226 which are unusable due to various deficiencies. Defense Personnel Support Center has agreed to give recipients of these defective helmets manufactured under contract DLA-100-80-C-2226 *only* full credit. Procedure for return and credit follows: Submit SF 364, Report of Item Discrepancy (ROD) to CDR, DPSC ATTN: DPSC-ITEF, 2800 S. 20th St., Philadelphia, PA 19101. Return helmets with a copy of SF 364 to: Defense Depot, Mechanicsburg, PA, ATTN: DDMP-JQ (MARK FOR CONDITION CODE "L," MECHANICSBURG, PA 17055). Defective helmets received from other contracts should be reported by Quality Deficiency Report, in accordance with Chapter 12, TM 38-750. Above data is also being disseminated via DPSC Supply Information Letter.

Oxygen Throw-Away Masks Maintenance/Inspection

Dear PEARL, can you tell me what we should be looking for when we inspect the throw-away type oxygen masks? We know what to look for when we inspect the regular type oxygen masks, but these other masks have us in a dilemma.

Glad you asked that question because we have been getting a number of inquiries pertaining to this area. We consulted the Air Force and Navy and basically the following would prevail on throw-away type oxygen masks:

Check the facepiece for holes, cuts or tears; examine valve(s) housing for cracks, breaks and damage to valve seats; check oxygen reservoir bag and tube assembly for holes, cuts, tears or imperfect seams; check tubing for security of installation and distortion; check tubing for cracks, kinks and evidence of crimp tubing marks; check head strap for distortion, elasticity, cleanliness and security of installation; visual "daylight" inspection of all accessible surfaces which will be in contact with oxygen shall disclose no evidence of rust scale, dirt, paints, preservatives and organic materials such as grease, oil, ink and dye; wipe dust from facepiece, using a clean lint free cloth dampened with isopropyl alcohol. WARNING—the presence of oil and other petroleum base contaminants on oxygen equipment will create a dangerous fire hazard. If there is evidence of contamination due to air sickness, dispose of the complete mask assembly; after deployment or use, clean and disinfect mask with disinfectant approved by the Surgeon's Office.

Lensatic Compass

Reference is made to message R 221530Z APR 82, from 97 BMW Blytheville AFB, AR//LGSMS2//to this office; subject is requisition of health hazard radioactive item NSN 6605-00-151-5337YS. Item has been identified as radioactive and users are herewith alerted to this fact. This item is required and is mandatory and must be installed in individual survival kits used aboard applicable Army aircraft. Exercise caution when using.

Nomex Thread

Dear PEARL, I have been looking for an NSN for Nomex thread (gray), and was hoping that you could provide it. The OD thread is available at most units but the gray Nomex thread needed for repair of the one-piece flight suit seems to be scarce.

PEARL is always happy to oblige so here goes: Nomex thread sage green can be ordered as a unit tube NSN 8310-00-405-2252 at a cost of $8.96 per tube. As you are probably aware the Army is using USAF TO 14P3-1-112 (Maintenance Instructions for Nomex single piece flight suit sage green). The thread specified is MIL-T-83193, and can be ordered from DPSC (S9T) using the aforementioned NSN.

Seat Belts

Reference is made to the April 1982 issue of the *Aviation Digest* PEARL article "OBSOLETE SEAT BELTS." That portion of the article, national stock number (NSN) 1680-00-787-4299, should be disregarded

PEARL'S

as it is in error. Only the seat belt NSN 1680-00-787-6531 should have been included. In order to set the record straight, we researched the whole seat belt area and coordinated the following data with TSARCOM Directorates for Maintenance and Materiel Management: NSN 1680-00-787-4299, this belt *must* still be requisitioned as the prime belt for *UH-1V aircraft only* due to configuration required for *litter application.* NSN 1680-00-447-9504, this belt and all substitutes are being replaced by *NSN 1680-01-128-4488**. Existing stock of *NSN 1680-01-128-4488** will be the replacement belt for the above NSNs with the *exception* of the UH-1V litter application noted above. NOTE: *DO NOT requisition the replacement belt *NSN 1680-01-128-4488* until officially notified to do so. For further information/clarification, points of contact are: Mr. D. Boone Hopkins (AUTOVON 693-3112) and Mr. James E. Alexander (AUTOVON 693-3308).

New Office

DARCOM HQ has established a Commodity Management Office for Clothing and Individual Equipment as a branch of the Command Control and Surveillance and Support Division of the Directorate for Supply, Maintenance and Transportation. Their mission is to monitor all clothing developmental/fielding actions, and introduction of new items. Ms. Vivian McKenzie, GS-14, and LTC Bob Surratt, formerly of Defense Personnel Support Center, are a part of the staff. The telephone number is AUTOVON 284-8231/9531. This new office will not be fully operational until 31 October 1982.

U.S. Army Logistic Assistance Office, TRADOC

We in the ALSE area appreciate the support the U.S. Army Logistic Assistance Office, TRADOC, has been providing through their TRADOC Executive Digest Reports. Colonel William E. Gregerson, Military Police Corps (MPC) is the chief of this office and can be reached on AUTOVON 680-3637 or by mail, USA Logistic Assistance Office, TRADOC, ATTN: DRXLA-TR, PO Box 97, Ft. Monroe, VA 23651.

Thanks

We would be remiss if we did not pay an accolade of thanks to Major Jim Foster, HQ TRADOC, Ft. Monroe, VA, and Mr. Ray Birringer, TRADOC ALSE representative, Ft. Rucker, AL. Major Foster and Mr. Birringer have and hopefully will continue to provide outstanding expedited support to the critical area of ALSE. Many of the immediate actions have been achieved through their "get the job done" attitude. We understand, through the "grapevine," that Major Foster will be leaving soon to attend the Command and General Staff College. His replacement has not yet been announced, but LTC "Chuck" Lesko will keep the ball rolling. We also owe thanks to other ALSE Management Council members—FORSCOM's CW3 Jeff Alley for his effort on prepositioned ALSE, and The Surgeon General's Office COL Bruce Chase for his support on resolving medical problems the aircrew personnel are confronted with. We also thank all ALSE council members for their efforts and continued support. Always remember, PEARL cares.

Carbon Dioxide Cylinders For Liferafts

Dear PEARL, I have several questions and your timely expert answers have always been of help to us field users of aviation life support equipment. What is the importance of having a spring adapter installed in the carbon dioxide cylinder inflation valve? I have been having trouble getting replacement carbon dioxide cylinders for the one-person-type liferaft and I have ordered them under NSN 1680-00-097-0104, but my requisitions are returned without action. Can you tell me what, if anything, I am doing wrong? Someone told me that I should be ordering the valve and cylinder/assembly under NSN 4220-00-565-3276; is that correct? Why can't I have the cylinders refilled locally?

You have asked some very important questions and we will answer them in the order you asked them. A spring adapter must be installed in the carbon dioxide cylinder inflation valve to allow the packed raft to "breathe" while being carried aboard an aircraft flying at high altitudes. In the past, carbon dioxide cylinders for one-person liferafts were ordered under NSN 1680-00-097-0104 from B-17. Because it was difficult to have them locally recharged due to lack of carbon dioxide high pressure recharging equipment, they are now ordered under NSN 4220-00-565-3276 as a valve and cylinder/assembly from S9C. We are taking another look at this to determine if it would be cost effective to stock the 0104 cylinder and have them locally recharged. Your local Fire Department formerly had the recharging capability but, because of the new type of fire extinguishers, most of them might not still have this capability. We hope this information will be helpful and will resolve some of the problems you have been encountering. TM 55-1680-317-23 & P provides detailed inspection and maintenance information.

If you have a question about personal equipment or rescue/survival gear, write PEARL, DARCOM, ATTN: DRCPO-ALSE, 4300 Goodfellow Blvd., St. Louis, MO 63120 or call AUTOVON 693-3307 or Commercial 314-263-3307

FORTY YEARS OF ARMY AVIATION

Richard K. Tierney
Editor, *Aviation Digest*

Part 3: COMBAT

World War II

Army Aviation's initial entry into combat was far from glamorous. It began on 10 October 1942 at Fort Sill, OK, when Captain Ford E. (Ace) Allcorn received orders to report to Camp Pickett, VA. There he was directed to select three people from a group of Army aviators that had been assembled there and then report to the divarty (division artillery) commander of the 3d Infantry Division at Hampton Roads, VA. He selected Captain Brenton A. Devol Jr., and Lieutenants John R. Shell and William H. Butler. At Hampton they were told that three L-4s were aboard the aircraft carrier ***USS Ranger*** and that they were to fly them ashore to direct artillery fire during the invasion of North Africa.

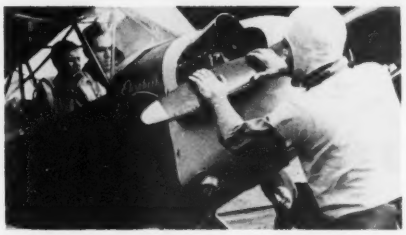
The four joined the ***Ranger*** at Bermuda where they quickly discovered that the L-4s were in bad condition. But by the time they were off the North African coast, the group had their Cubs ready for combat.

On 8 November the invasion started and the four Army aviators were placed on alert. As they waited, word from the shore was discouraging. Inexperienced American troops on the beach had shot down several of the ***Ranger's*** planes.

The next day the Army aviators were ordered to take off. A request to notify American units on shore that the L-4s would be approaching from the sea was refused by the skipper of the ***Ranger*** who declined to break radio silence. The ***Ranger*** had been under torpedo attack and was running in moderate seas at full speed of about 25 knots. That meant the L-4s had to take off into a 35 knot headwind about 60 miles at sea. "Taking off was no chore," Captain Allcorn recalled later. "Some of the crew held the plane back while I

LEFT: ***Captain Ford Allcorn flies his L-4 Cub from the USS Ranger during the invasion of North Africa in 1942.***

BELOW: ***Lieutenant William Butler (front seat) and Captain Brent Devol prepare to takeoff from the USS Ranger during the invasion of North Africa in 1942. Their L-4 Cub was named Elizabeth.***



gunned it. I was in the air almost as soon as they let go."

Captain Allcorn took off first (in L-4 No. 204) and made a 360-degree turn before joining up with the other two aircraft. The plan was to fly to Fedala where a racetrack was to be used as a landing strip.

The Cubs flew at about 2,000 feet to a point 3 miles from the shore where they were fired upon, and narrowly missed, by the ***USS Brooklyn.*** The Army aviators immediately dived for the surface and flew what might be called "nap-of-the-sea" toward the shore. Meanwhile, almost all the 200 ships in the invasion convoy opened fire with 20 mm guns on the three L-4s, despite the fact that they were painted with invasion markings.

Lieutenant Butler, flying one Cub with Captain Devol riding as observer, and Lieutenant Shell, piloting the other L-4, headed north away from the invasion site. Later they landed near a French fort and were taken prisoner for a brief period.

Meanwhile Captain Allcorn, flying between the swells and taking fire from shore batteries, flew along the coast. When he was off Fedala he pulled up and headed inland. Immediately units of the 2d Armored Division peppered his L-4 with 30 caliber machinegun bullets, disintegrating its windshield and blowing away portions of the cockpit. He recalled, "I stayed as low as possible and as I got farther inland I realized I was not going to get to the racetrack and that I was getting ahead of the Allied advance."

Suddenly a burst of fire from a Vichy French machinegun hit Captain Allcorn in the leg. At the same time the L-4 burst into flames and Captain Allcorn had to slip the airplane into the ground in a controlled crash. He crawled from the cockpit and dragged himself about 50 feet across the ground to a point where he watched the L-4 explode and burn.

Captain Allcorn, aided by friendly civilians, was taken to an American aid station. Later X-rays revealed he had been hit five times in the leg by 25 caliber slugs. In addition to being the first Army aviator in combat, Captain Allcorn was the first to fly a Cub from an aircraft carrier, the first Army aviator to be wounded in combat and the first to be shot down—not a dubious honor under the circumstances.

Besides the four who flew from the ***Ranger,*** there were other Army aviators from the first three pilot classes who participated in the invasion of North Africa. These included Lieutenants John W. Oswalt, Bob Ely, Eugene Gillespie and Robert Johnson.

In late November and early December a number of Army aviators were attached to British units which were heavily engaged with the German Africa Corps in Tunisia. It was during this period that Lieutenant Paul A. Dewitt became the first Army aviator to fly an artillery mission in a Grasshopper in World War II.

In January 1943, the first air observation post sections were organized within Ameri-

can tactical units in North Africa. Lieutenant Oswalt organized the 1st Armored Division Air Section while the 1st Infantry Division's was initiated by Lieutenant Jesse Overall III. Meanwhile, Captain Delbert Bristol organized a senior tactical headquarters in II Corps to control employment of the division air sections. He also handled aviator assignments and flight records, and established the first Army Aviation parts supply system in a combat zone.

As the Army aviators became more proficient they developed more and more missions in support of the ground forces. Their ability to gather intelligence, coupled with the fact that they could trigger instant and devastating firepower (from artillery), was of great importance, as illustrated by an incident that occurred in March 1943. After Army aviators had uncovered a major thrust being launched by the German 10th Panzer Division, they were able to direct a withering artillery barrage that helped stop the assault. A penetration of the Allied lines was averted.

The ingenuity of people associated with Army Aviation was directly responsible for its growth and success. An example was Captain Devol who had flown from the deck of the ***USS Ranger.*** He constructed a flight deck on an LST (Landing Ship Tank) taking only 36 hours of work. The runway was 12 feet wide

An L-4 Cub flies from the deck of an LST during Mediterranean invasion rehearsals.

and 70 yards long. It was constructed of timbers covered with metal landing strip mesh. Four Cubs took off from an LST in the Sicilian landings. The operation was successful and the LST "aircraft carriers" were effectively used at Anzio and in Southern France. Captain Devol was awarded the Legion of Merit for his work.

Field expediency also was demonstrated in Italy by Army aviators as related in the story of the Futa Pass "Ski Jump" airstrip. Due to rugged mountain country it was extremely difficult for Fifth Army Commander General Lucius K. Truscott to visit units under his command. Traveling by jeep was not practical, so General Truscott made frequent use of the Cub to get about in the Futa Pass area. General Truscott's headquarters was a 30-minute jeep ride (and an often-times impassable river) away from the nearest airstrip. Disturbed over this, General Truscott told his air officer, Captain Jack Marinelli, to get an airstrip built near the command post—"and the sooner the better." After much study, the airstrip was built on a mountainside. It was 735 feet long and 30 feet wide. The upper end was 98 feet higher than the other end, and the whole airstrip had the appearance of a ski jump. The lower part ended abruptly with a sheer 2,000 foot drop-off to the valley below.

"The interesting feature," according to Captain Marinelli, "was that we had to use full throttle to taxi to the top of the strip after landing. But you could also take off down the strip without power."

Many general officers made frequent use of the Cubs, especially General Mark Clark, who on one occasion had his pilot, Captain Eugene P. Gillespie, land his L-4 on the Boulevard Carrageola in the heart of the city of Naples. Many Neopolitans were astounded, but the general made it in time for an urgent meeting that he could not get to by other means of transportation. A short while later, in the assault on Rome, General Clark and his pilot, Lieutenant Colonel Jack Walker, made the famous L-4 landing near Rome inside a school courtyard formed by buildings and an 8-foot brick fence. When it was time to depart, Colonel Walker assured the general that he had enough room to take off. "He did," General Clark recalled, "by a margin of 3 inches."

During the assault on Rome, Captain John Oswalt landed his L-4 on a racetrack on the

The fifth Army's "Ski Jump": airstrip was built at Futa Pass, Italy, in 1944.

INSET: ***The L-5 Sentinel joined the fighting at about the time Rome fell to the Allied forces.***
ABOVE: ***Lieutenant Dave Condon and his L-5 at Utah Beach on D Day + 1.***

outskirts of the city to contact lead tanks and armored cars. Within minutes Captains Bill Holden and Bill McKay landed to help coordinate the attack. After Rome fell, Army aviators flying L-4s pressed the surveillance of the German Army as it retreated north. During the pursuit, the first L-5 Sentinels, heavier type liaison planes, were employed in increasing numbers by the Fifth Army.

The addition of the L-5 brought many comments at the front. Some felt the L-5 was too heavy and should not be used, while others thought the L-4 was underpowered and preferred the L-5. But both airplanes had their good points. The L-4 was extremely maneuverable and able to get in and out of many more confined areas than the L-5. On the other hand, the L-5 carried more of a payload, and it had a few instruments and a lighted instrument panel which made it more effective in night operations.

During the invasion of France in June 1944, most of the Army's liaison planes were dismantled and loaded on trucks that were moved across the English Channel on ships. However, a few were flown across.

Captain James Gregorie, 4th Infantry Division Artillery Aviation Officer, landed at Utah Beach with the 4th Infantry on D Day. The next day he found a suitable area for an airstrip and sent a message to Lieutenant Dave Condon to have the division's L-4s and L-5s flown from England.

The L-5s carried enough fuel to make the trip, but it was necessary to equip the L-4s with oxygen tanks filled with fuel and attached to the back seats. A fuel line running from the oxygen tank to the main tank gave the L-4s 20 additional gallons of gas. By the time the aircraft arrived in France the division's artillery was set up, but the guns were not registered because hedgerows limited visibility. Since the primary concern was to get the guns registered and firing, Captain Gregory and Lieutenant Condon immediately took off in an L-5 and registered the first artillery fire on Utah Beach.

Meanwhile Major J. Elmore Swenson and his "29th Air Force," as he called his 29th Infantry Division Artillery Aviation Section, arrived at Omaha Beach. In minutes Major Swenson was directing the first artillery fire in that area.

As the Allies began penetrating the Brittany Peninsula, the liaison airplanes often were the only source of contact with the

TOP: *An L-4 is dwarfed by an LST in New Guinea. L-4s saw action throughout the Pacific in World War II.*

ABOVE: *Wrecked Japanese Zeros line an airfield in Tokyo used by L-4s at the conclusion of the war.*

rapidly advancing armored columns. The planes also flew out in front of the Allied advance, keeping track of the enemy's positions. In addition, the cubs directed supply columns and flew food, ammunition, and medical supplies to patrols and/or troop units.

As in Europe, the role of the Cubs became increasingly more important to the ground commanders in the Pacific. The liaison pilots fighting the Japanese demonstrated just as much ingenuity and initiative as their counterparts did in Africa and Europe.

During the invasion of Okinawa the light planes effectively operated from the Brodie Device mounted on an LST. Named for its developer, Lieutenant James Brodie, it consisted of four masts which supported a strong horizontal steel cable that provided a straight, smooth, clear runway for landing and taking off. A trolley with an attached sling under-

The Brodie Device was used on LSTs to land and launch L-4s.

neath caught a hook mounted above the center of gravity of the airplane. The trolley ran along the cable and allowed landing and takeoff runs. The airplane was raised from or lowered to the deck by tightening or slackening the cable.

In the Pacific the device was mounted on LST No. 776 which also became known as the ***"USS Brodie."*** It was at Okinawa that the device paid off. There was an urgent requirement to set up artillery units in the Kerama Retto Islands to bombard the Japanese on nearby Okinawa. Photography and aerial observation were needed by the artillery batteries, but there was no place to set up a landing strip. That's when the ***"USS Brodie"*** "steamed" to the rescue. It launched and retrieved numerous airplanes throughout the invasion, and not an Army aviator or plane was lost.

In the Pacific the liaison pilots also directed transport planes and ground troops, dropped food and ammunition to surrounded troops, and guided tactical air strikes.

The Korean War

While World War II proved the value of Army Aviation in support of the ground forces, the Korean War proved that its potential was unlimited. With the introduction of newer airplanes and helicopters, the Korean battlefield spawned new ideas on airmobility and aerial medical evacuation.

In the early stages of the war L-4s, L-5s, and some L-16s were used. But they were soon replaced with the newer L-17 Navion, L-19 Bird Dog, L-20 Beaver and the L-23 Seminole.

The single engine L-17 did a good job in courier work, but was not designed for use in combat. In late 1952, it was replaced by the twin engine L-23 which was used primarily for the transportation of commanders and staff officers. The L-20 was used for transporting equipment, supplies and troops; while the L-19, which arrived in Korea on 16 February 1951, became the favored airplane for reconnaissance and VIP transportation. It provided much better visibility, and everyone appreciated the heater which made it more comfortable to fly.

When the H-13 and H-19 helicopters arrived in Korea in 1950 and 1951, ground commanders quickly became aware that they could perform any diversified jobs in the combat zone. They offered airmobility and excelled in aerial medical evacuation.

The 6th Transportation Company (Helicopter) with its H-19 Chickasaws was the

ABOVE: *An H-19 (UH-19) Chickasaw of the 6th Transportation Company lands in 1953 in Korea with supplies for the 5th Regimental Combat Team.*

RIGHT: *H-13 medical evacuation helicopter in Korea in 1952.*

first Army helicopter transportation company to support units in combat. H-19s were flown from Japan to Korea in groups of five between 11 February and 24 March 1953. By 20 March, the 6th Transportation Company had enough H-19s in country to fly its first combat mission in which it supplied forward elements of the 3d Infantry Division. The 13th Transportation Company (Helicopter) arrived in Korea on 1 May 1953 and was the only other Army transportation helicopter company in Korea during the war.

The airmobile value (and potential) of the H-19 cargo helicopters was probably best stated by General Maxwell D. Taylor, the Eighth Army commander. During the war's campaign, he stated that he could not have maintained the right flank of the front of the MLR (main line of resistance) in its position without the assistance of the cargo helicopters. Some units had been forced back behind the main supply route and supply would not have been possible without the helicopters.

Helicopter evacuation of the wounded in Korea was not the result of a preconceived plan. It was more the result of expediency. The Eighth Army noted the effectiveness of many heroic medical evacuation missions that were flown in June 1950 in H-5s by the Air Force's Helicopter Detachment F, Third Air Rescue Squadron.

At the the request of Eighth Army, the Second Helicopter Detachment arrived from Japan in November 1950 at Tague, Korea, with its H-13 Sioux helicopters. The first Army helicopter evacuations took place 3 January 1951 when First Lieutenants Willis G. Strawn and Joseph L. Bowler each picked up wounded American soldiers 60 miles east of Seoul and returned to an American hospital at Seoul.

But the Second Helicopter Detachment, commanded by Captain Albert C. Sebourn, did not receive its baptism of fire until 14 January 1951 when its four pilots and four H-13s evacuated 23 critically wounded soldiers from a surrounded battalion. Despite intense enemy small arms fire over a 2½ hour period, all of the wounded were evacuated 25 miles to safety.

When active hostilities ceased on 27 July 1953, helicopter detachments under the control of the Army Medical Service had evacuated 21,212 casualties. In addition, division aviation elements had evacuated many more; and the 6th and 13th Transportation Companies (Helicopter) had achieved an enviable record in mass aeromedical evacuation.

Because of forward helicopter medical evacuation, the wounded reached medical assistance quicker and fewer of them died than in any previous war. And the H-13, "living" with and aiding the wounded throughout the war, was richly and deservedly honored by the nickname "Angel of Mercy" affectionately bestowed upon it by the troops.

The first CH-21 Shawnee, flown by Major Robert J. Dillard, commander of the 57th Transportation Company, arrives in Vietnam as it takes off from the deck of the USNS Core.

Vietnam

During the administration of President Dwight D. Eisenhower the United States became more and more concerned about Communist activities in Southeast Asia. President Eisenhower sent military advisors to Vietnam, but the situation continued to worsen.

In 1961, President John F. Kennedy, concerned over the United States' responsibilities as a member of the Southeast Asian Treaty Organization (SEATO), sent General Maxwell D. Taylor to Vietnam to survey the situation. He reported a critical lack of mobility in the jungle-covered area; and on his recommendation, Army helicopters were sent to Vietnam.

On 21 November 1961, the ***USNS Core*** departed for Vietnam with the 57th Transportation Company (Light Helicopter) from Fort Lewis, WA, and the 8th Transportation Company (Light Helicopter) from Fort Bragg, NC. The small flight deck was loaded to capacity with CH-21s sealed in cocoons as protection from salt water spray.

The voyage ended on 11 December 1961 at a dock in Saigon. As quickly as possible the cocoons were removed and one by one the H-21s flew from the deck, down the Mekong River to Saigon International Airport. Major Robert J. Dillard, the 57th commander, flew the first H-21.

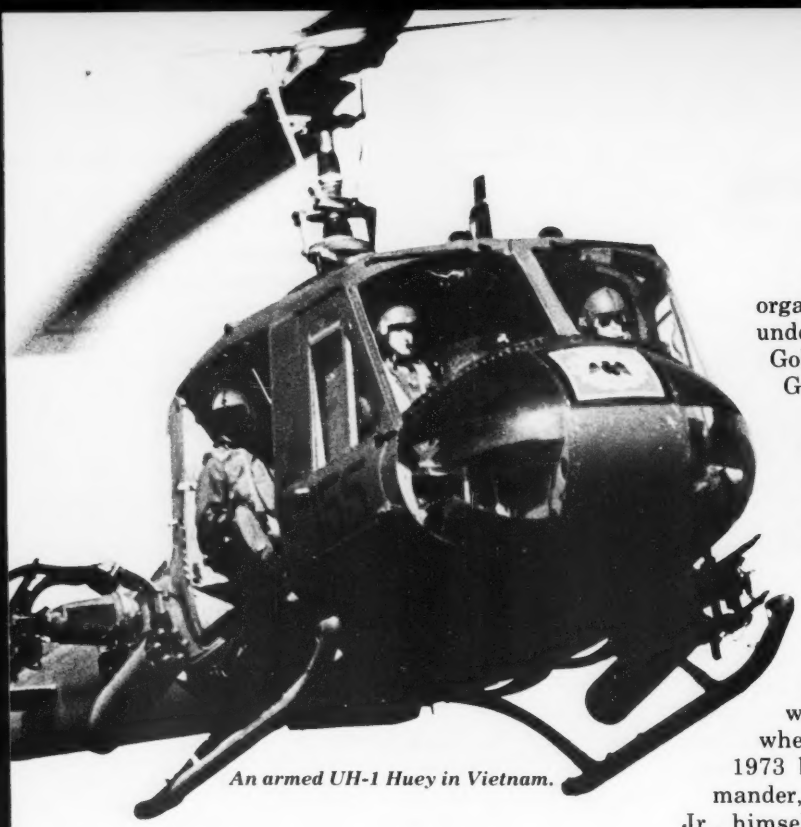
Both the 57th and 8th Transportation Companies began training exercises with South Vietnamese troops on 22 December. Major Milton P. Cherne of the 57th Transportation Company reported on the first airmobile combat action in which his company participijointly with the 8th. On 2 January 1962, they flew 1,036 Vietnamese soldiers into a "hole in the jungle," about 300 by 150 yards. The mission was a success, routing the surprised Viet Cong and enabling the capture of a considerable amount of equipment vital to the Viet Cong operations around Saigon.

The mission was performed with great speed and success, helping to convince the Vietnamese staff and commanders, of the great potential offered by the helicopter in airmobile operations. They had already been impressed by operations of the Army's U-1A Otter and CV-2 Caribou fixed wing transport airplanes that had preceded the helicopters arrival in Vietnam.

The first CV-2s arrived in Saigon in August 1961. Two years later there were two Caribou companies, totaling 32 airplanes, in Vietnam. They filled the gap between the helicopters and the larger Air Force C-123s by landing on short, unimproved airstrips. By 1964, the CV-2s were fully involved in the daily operations of the South Vietnamese Army.

Army Aviation operations grew rapidly, and by the end of 1964 it had 400 aircraft and 3,700 soldiers in Vietnam. The OV-1 Mohawk arrived in 1962 and conducted reconnaissance and surveillance missions. In 1964, the UH-1 Hueys arrived, and by the end of the year there were 250 in country. The Huey phased out the H-21 and H-34 and became the workhorse of the Vietnam War, moving troops and cargo, developing into an armed "attack" helicopter, and picking up the role of the "Angel of Mercy" OH-13 helicopter of Korean War fame.

Before mid-1965, organic Army Aviation did not exist in Vietnam. Its operations were primarily in specific geographical areas and it was under the control of the Military Assistance Command, Vietnam. But things began to change in the second half of the year. The



An armed UH-1 Huey in Vietnam.

1st Cavalry Division (Airmobile) began arriving at An Khe in the Central Highlands of Vietnam in August 1965. By 3 October the full division with its 15,787 officers and enlisted, 434 aircraft, and 1,600 vehicles was at An Khe. By November it was heavily engaged in combat near the Cambodian border at the Ia Drang Valley.

The bitter fighting raged for 35 days before the Viet Cong withdrew. But military planners had a peek at the seemingly unlimited potential of the concept of Army Aviation. In a little more than 1 month, an Army division—with its aircraft engaged in heavy and devastating combat operations—itself transported 5,048 tons of supplies to troops in the field; moved 8,216 tons from seacoast depots to its tactical resupply points; whole infantry and artillery battalions were moved into, around, and out of combat areas; and about 2,700 refugees were evacuated. Only 59 aircraft were hit by ground fire and only 4 were shot down, 3 of which the division recovered.

Army Aviation operations not organic to a division were organized under the 1st Aviation Brigade, the Golden Hawks. Brigadier General George P. Seneff Jr., became the first commander when it was organized as the U.S. Army Brigade (Provisional) on 11 March 1966. He was still in command when it became the 1st Aviation Brigade on 25 May 1966. The 1st Brigade grew to 23,000 officers and enlisted by 1970. When the last American troops departed Vietnam 29 March 1973, the brigade's colors were brought to Fort Rucker, AL, where they were received on 6 April 1973 by the Aviation Center Commander, Major General Alan M. Burdett Jr., himself a former commander of the Golden Hawks.

At its peak the 1st Aviation Brigade was the largest single Army Aviation command in the world. Although the commanding general of the brigade commanded the nonorganic Army Aviation elements in Vietnam, operational control of given units remained with the supported commander. The brigade combined the best features of centralized and decentralized control, which is in fact the heart of the concept of Army Aviation. The 164th Combat Aviation Group, operating as part of the 1st Aviation Brigade, was supporting three Vietnamese divisions of the Vietnamese IV Corps in the Mekong Delta with three aviation battalions. Each day the battalion commanders checked in with the divisional headquarters to ensure that their Army Aviation thrust was geared to support of the ground effort—primarily the Infantry which relied on the helicopter for support. They maintained a continuous command control link between the supported elements and the brigade headquarters. This philosophy permeated the 1st Aviation Brigade, whether its support was being rendered to

On 6 April 1973 MG Allen M. Burdett Jr., commanding general of Ft. Rucker, AL, and former commander of the "Golden Hawks," received the 1st Aviation Brigade colors from LTC James T. McQueen, commander of the colors detachment. CSM Francis Aquinaldo (center) and 1SG Allen Brewer, the top enlisted men of the brigade headquarters, accompanied colors to Ft. Rucker. CSM Clifton Wagner (left center) of Ft Rucker awaits reception of the colors.

American, Vietnamese or other Allied troops. Similar relationships existed for the 12th and 17th Groups supporting other Vietnamese corps.

For religiously sticking to its Army Aviation concepts of support of the ground battle, General Creighton Abrams, commander of U.S. Forces in Vietnam, paid the highest of tributes to the 1st Aviation Brigade by saying:

> "It has always been interesting to me to note that the aviators and men of this Brigade have been taken into the brotherhood of the combat arms. Not by regulation, not by politics, but they have been voted in by the Infantry...the charter members of that secluded club, the combat arms."

Early in the war the Army's transport helicopters were being protected by Air Force B-26 and T-28 aircraft which flew escort. Meanwhile, the Army was experimenting with attempts to provide protection by mounting light machineguns in the doors of its CH-21 transports. This proved ineffective, but the emergence of the UH-1 Hueys armed with 30 caliber machineguns and 2.75-inch rockets brought about the formation of the Utility Tactical Transport (UTT) Helicopter Company (see PART IV, ARMED HELICOPTERS, Armywide Growth).

The UTT fielded some 20 armed Hueys in Vietnam in 1962 to fly escort and provide protective fires for the CH-21 transports. As soon as they replaced the Air Force escorts, the number of light helicopters hit by ground fire dropped significantly. Most of the tactical doctrine used later during helicopter assault missions was developed by the UTT.

Since this was such a success, it was not long before each separate lift company had 7 to 10 armed Hueys, thus providing organic

Army Aviation Medal of Honor Awardees

Major William E. Adams
Major Patrick H. Brady
Warrant Officer Fred Ferguson
Chief Warrant Officer Michael J. Novosel
Warrant Officer Louis R. Rocco
Specialist 4 Gary G. Wetzel
Sergeant First Class Rodney J.T. Yano

escort and suppressive fire. As a consequence, the UTT was redesignated the 68th Aviation Company and later the 197th Airmobile Company.

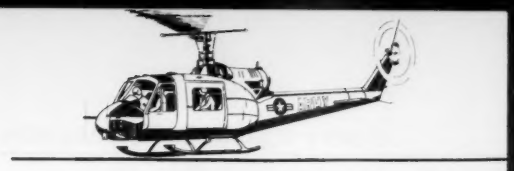
The role of the armed helicopter grew in Vietnam after the introduction of the armed UH-1. But the Huey was slow and its ammunition capacity limited. The situation improved, however, when the first six AH-1 Cobras (then called Huey Cobras) appeared on the scene in September 1967 at the 1st Aviation Brigade. Designed as attack helicopters, the Cobras were much faster, more maneuverable gun platforms than the UH-1s. The AH-1s would prove their worth time and again until the end of the U.S. presence in Vietnam.

Airmobility became more and more important, and by the late 1960s no major battle was fought without helicopters providing transport, reconnaissance, surveillance, communications and firepower. In fact, the concept of Army Aviation had proven so successful that the Army formed a second airmobile division in Vietnam.

On 1 July 1968 the 101st Airborne Division was converted to the 101st Airborne Division (Airmobile). It played key roles in the 1968, Tet Offensive and a series of combat operations in I Corps' tactical zone, to include Operation Delaware near the A Shau Valley. (Following the war in Vietnam, the 1st Cavalry Division was discontinued as an airmobile division. However, an airmobile/air assault capability was retained when on 4 October 1974 the 101st Airborne Division (Airmobile) was reorganized into the 101st Airborne Division (Air Assault).

In the early hours of 31 January 1968, the Viet Cong (VC) and the North Vietnamese Army launched the Tet Offensive aimed at

An AH-1 Cobra attack helicopter in Vietnam



seizing power in South Vietnam and causing the defection of major elements of the Army of the Republic of Vietnam (ARVN). One of the enemy's chief objectives was to seize Saigon's Tan Son Nhut Air Base. More than 3,000 enemy soldiers had slipped into Saigon and launched an attack at about 3:25 AM. Bloody hand-to-hand fighting broke out. Within 3 minutes after the alert at Tan Son Nhut, four armed helicopters were airborne and attacking the enemy. Meanwhile, Major General Robert R. Williams, 1st Aviation Brigade commander, was airborne in a command and control Huey checking into the 12th Combat Aviation Group control net. He soon learned that the enemy, some in Viet Cong "pajamas" and others in standard North Vietnamese Army (NVA) uniforms, were attacking at 100 points along a 500-mile front.

The armed UH-1s, plus the few AH-1s in country at that time, were widely acclaimed as having played a key role in stopping the Tet Offensive. Later that year the 1st Cavalry Division (Airmobile) broke the NVA siege of Khe Sanh. By the end of 1968, the NVA and VC had been so badly hurt that they were unable to launch a major campaign over the next 2 years. This setback would not have been possible without the firepower and mobility provided by Army Aviation. In fact, without Army helicopters the war might have been lost in early 1968.

After the impressive victories in 1968, the American policy quietly shifted to turning the war over to the ARVN and withdrawing American forces. To protect the American withdrawal, President Richard Nixon directed that the enemy's sanctuaries in Cambodia be destroyed. The resulting attacks in 1970 by American and ARVN airmobile forces in conjunction with ground thrusts were most successful. The effectiveness of the airmobile assaults in the enemy's backyard brought high praise from many high ranking general officers. Lieutenant General John J. Tolson III, who had once commanded the 1st Cavalry Division (Airmobile), said that "the 1st Cav airmobile operation far exceeded all expectations...." But as U.S. forces were being withdrawn, the LAMSON 719 engagement awaited Army Aviation.

In 1971, as American forces were well on their way out of the Vietnam War, a large-scale attack, dubbed LAMSON 719, was launched at the Ho Chi Minh Trail by ARVN ground forces supported by U.S. Army helicopters in the transport and air cavalry roles.

The air assaults were met with intense and highly sophisticated NVA antiaircraft weapons systems. Losses of helicopters were heavier than normally had been experienced in the South Vietnamese environment. For many years critics of the Army's airmobile concepts had been claiming that helicopters were too vulnerable in combat. The LAMSON 719 events triggered a renewal of their criticism.

While the Army was concerned about the losses, it was reasoned they were not excessive in light of the highly sophisticated battlefield environment of LAMSON 719. In fact, one of the most encouraging points to come out of the LAMSON 719 experience concerned the attack helicopters' successful encounters with enemy tanks, which occurred on numerous occasions while the helicopters were flying reconnaissance. The standard procedure was to engage the tanks until the Air Force would take over. When the fighter-bombers were not available, the AH-1 Cobras would engage the tanks—and at least 10 tanks were destroyed. Had antitank weapons been available to all of the AH-1s and UH-1s, many more enemy tanks would have been killed.

The Army has not forgotten the lessons of LAMSON 719. Today it has fielded newer, more modern, more survivable helicopters such as the UH-60 Black Hawk that carries an infantry squad of 11 fully-equipped combat troops, and the improved CH-47D Chinook which can support more of the logistical mission; also the greatly improved AH-1S

fully modernized Cobra and the emerging AH-64 Apache attack helicopter, both of which can destroy enemy armor; plus the new scout, the AHIP, which stands for Army Helicopter Improvement Program and translates into a greatly improved OH-58 that meets the Army's immediate scout helicopter needs. To those developments add constantly improving air assault tactics and flight techniques, ever improving training and standardization programs, plus other hardware improvements such as mast-mounted gunsights. All of this gives Army Aviation the capability to fly and fight in adverse weather conditions, to engage and defeat armor, and to survive against the sophisticated weapons of the modern battlefield.

An AH-1 Cobra attack helicopter

VIEWS FROM READERS

Editor:

I am very impressed with the articles on NBC that have appeared in *Aviation Digest* and would like to obtain a copy of each article in the series.

(1) NBC—Training and Development—Aug 1981.

(2) NBC—Decontamination Problems—Oct 1981.

(3) Chemical Agents, First Aid and Long-Term Effects—Dec 1981.

(4) Also, any other articles that may have been published in Feb 1982.

SGT Kenneth W. Ellis
B Co, 1/23 Inf
APO San Francisco

Editor:

Please forward to me the following:

The First Army Aviator/June 1962, inside back cover

The First Army Aviation Pilot Class/July 1962, page 11

The First Army Aviators in Combat/November 1962, page 36

B. B. Blevins, D.D.S.
Oak Ridge, TN

Editor:

We are writing to request, if available, the issues of *Aviation Digest* for June and July 1980, containing the excellent articles by General Harry W. O. Kinnard.

Additionally, our company is under contract to TRADOC in which receipt of the information of the type contained in the *Digest* would be most helpful, and we would sincerely appreciate it if our name could be placed on your distribution list.

Finally, with regard to your interest in the documentation of Army Aviation history, the writer may be able to provide copies of photographs relating to the Army's World War II experiments with the Brodie device (fixed wing launch from guide wires). These pictures were copied years ago from originals made available by a pioneer of Army Aviation—the late Bill Gardner, who participated in this work and later played a key role in the creation of Project Flatop *(USS Corpus Christi Bay)*.

Please let me know if they would be of interest.

George Chernowitz
Director, American Power Jet Company
Arlington, VA

• To obtain an annual subscription to the *Aviation Digest* it will be necessary for you to send a remittance of $26.00 to: Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402. Your offer of Brodie device pictures is appreciated.

Editor:

Yellow Is Better

Yes.

Knowledge, with very little help from aircraft instrumentation.

Hopefully we won't have to wait a long period of time before they realize that aircraft operators come up with some damn good ideas concerning modifications that actually aid the individual aviators in aircraft control and performance!

Our thanks to CW3 Gary E. Rossomme, *Aviation Digest,* May 1982, page 38.

CW2 Billy L. Johnson
Ft. Polk, LA

Editor:

In response to CW3 Rossomme, Yellow is Better; I would like to be his yellow light in the dark. His point of yellow light exhibiting more desirable characteristics is not new and from a technological standpoint only begins to scratch the surface in the area of lighting (external, cockpit, signature, etc.). The "user requirement" CW3 Rossomme refers to in his article unfortunately is not the pilot, this refers to TRADOC. TRADOC is the proponent for user requirements, more specifically they are referred to within the DARCOM community as the combat developer. Each of the major aircraft systems has a proponent TRADOC System Manager to act as the point of contact (the user) and address the user requirement. The System Manager works with respective proponent schools/centers to provide input required for system changes. For example, the Armor Center has proponency for attack and scout airframes, the Transportation Center for cargo, and so forth.

Once a requirement has been identified, i.e., yellow landing lights, it comes to the Materiel Developer (AVRADCOM) in the form of a required operational capability (ROC). AVRADCOM prepares a Product Improvement Program (PIP) and the next event in this process is funding, *IF* the user supports the project at a fundable level. Bear in mind that many PIPs are approved by the user but never are supported at a level to achieve funding. Funding for development comes from Project Manager, Program Management Office or Readiness Project Office (TSARCOM) in the form of reimbursable funds. Then, and only then can AVRADCOM and TSARCOM produce a "better mousetrap."

Granted this is a very simplified/condensed answer but it should shed some light on the problem.

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MONTHLY WRITING AWARD

THREAT

SOVIET AIR DEFENSES
Against Attack Helicopters

PART III: ZSU-23-4 Shilka

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APO New York

UNITED STATES aircraft have never flown against the Soviet ZSU-23-4, as they have against Soviet small arms fire and the SA-7. The ZSU-23-4 is a self-propelled, four-barrel 23 millimeter (mm) automatic antiaircraft system mounted on a slightly modified PT-76 chassis. First seen in 1966, it was specifically developed to provide low-level air defense for the motorized rifle and tank regiments. It has a four-man crew, carries between 1,300 to 2,500 rounds of 23 mm ammunition in internally stored cannisters and is credited with a rate of fire of 1,000 rounds per barrel per minute. The ZSU is capable of firing on the move due to the integrated radar/gun stabilization system. It is generally reported as having three modes of firing; however, the Soviets have described a fourth mode. The modes are: (1) radar control; (2) electro-optical (radar gives range only); and (3) optical. The Soviets describe the fourth mode as "unique," and say: "Work proceeds briefly according to 'remembered' coordinates of the target and their rates of change. Here, it is assumed that the target is moving evenly and in a straight line in any

plane. The mode is put into effect if there is danger of losing the target by radar during its automatic tracking because of interference or inaccuracy." Western sources claim the guns are capable of effective fire in the optical mode to 2,500 meters and, with radar, out to 3,000 meters, although the Soviets claim an effective range of only 2,500 meters.

The GUN DISH radar has a very narrow beam which not only provides excellent aircraft tracking but is also difficult to detect and evade. It may also have an IFF (identification friend or foe) capability.

The ZSU is organic to the motorized rifle regiment and tank regiment with one battery of four ZSUs assigned. It is not organic to airborne units.

At regimental level the complementary SAM (surface-to-air missile) is the SA-9, about which almost nothing appears in the Soviet press. It is not organic to battalion level and, therefore, will not be discussed here except to say that it is generally described as a vehicular-mounted, improved SA-7. Many of the previously mentioned limitations of the SA-7 would apply to this weapon as well. The Soviets hold the ZSU in high regard. The record of the ZSU in the 1973 Arab/Israeli Mideast War, when it was credited with about one-third of all Israeli aircraft losses, would indicate that it presents a formidable threat.

Soviet military literature describes how they plan to use this weapon in combat. In the assembly area, regimental ZSUs will normally join the battalion which will be acting as the advanced guard for the march. This battalion will normally be assigned sectors to defend, paying particular attention to probable low-level approaches. During this period, detection of aircraft in the area will be accomplished primarily by visual observation and, perhaps, one of the ZSU's radars. The Soviets are aware of our ability to detect their radars. A 1979 Soviet military publication stated that in the assembly area "... it is easy for the enemy, who has appropriate equipment available, to determine the number of operating sets, their characteristics and the combat formation, operating frequencies, and finally the probable composition of the forces being concentrated." Since our attack helicopter pilots have been trained to use their onboard AN/APR-39 radar warning receiver to detect ZSUs, they should know that this system will not be reliable in approaching a Soviet battalion assembly area. It may detect one radar, but there will be four ZSUs.

On the march, the ZSUs may be anywhere within the column. It is the battalion commander's decision and much depends upon the level of air activity he expects to encounter. There are, however, two recommended methods of ZSU distribution within the column. If the column is moving without expecting a meeting engagement at a predetermined location, the ZSUs should be found in the column of the company with which the battalion command and observation post is moving. If the air situation is particularly hostile, one ZSU will be positioned near the head of the column and another near the rear. The ZSUs will probably respond to air attack by firing from short halts and employing a leap-frog technique of fire and maneuver.

When a column is moving to a meeting engagement at a predetermined location, the ZSUs are normally spaced at 500 to 700 meter intervals. This column will probably not halt for an air attack and the ZSUs are reported to fire from the move while keeping their place in the column.

There are two other nonstandard variations concerning placement of ZSUs on the march. One Soviet source recommends deploying ZSUs along the most susceptible flank in the case where there is only one avenue of low altitude approach or the possibility of a tank "killing zone" being created. Another Soviet author recommends the variant of sending some of the ZSUs forward of the column to be ready to conduct fire before the approach of the screened companies and battalions.

During the assault, the ZSUs will form a line of platoons with each platoon (two ZSUs) supporting a first echelon motorized rifle company. In the case of a regiment advancing with two battalions in the first echelon, each will normally be assigned a ZSU platoon. In any event, the ZSUs will invariably be located 300 to 400 meters behind the attacking tanks or BMPs (Russian infantry combat vehicles) and, depending upon the width of the battalion sector, with a linear separation of 150 to 200 meters.

The ZSUs will display less strict fire control in the assault than during any other maneuver. Normally, they will fire based upon previously issued instructions and will fire at any aircraft which appears to threaten the supported unit. Interestingly enough, in two recent Soviet articles ZSU gunners were forced to decide between firing at fixed wing attackers or helicopters which were simultaneously attacking the Soviet unit. The solution in both problems was to concentrate the fire on the helicopters first because they present the greatest danger for the tanks.

It is interesting to note that ZSUs will very rarely be used in a direct fire, ground combat role. During one reported exercise a ZSU opened fire on an enemy APC (armored personnel carrier). The author of the article criticized this action. "It is a very dangerous tactic," he writes, "which is allowed when necessitated by self-defense measures."

In the defense, the ZSU is a particularly dangerous air defense weapon. The ZSUs will be camouflaged, vehicle tracks will be covered, and most will turn the radars off in order to achieve surprise in the attack. In this case target data will be provided by higher

ZSU-23-4 Shilka

continued

headquarters. Only in the case of a battalion in the defense, separated from the regiment, are the radars left on. Each ZSU will have predetermined alternate positions. After engaging an aircraft, the ZSU will move for its own protection and to deceive the air enemy as to the actual location of the air defenses and the unit supported.

Roving guns are particularly dangerous. Generally, the battalion is responsible for the destruction of helicopters within a linear sector to the maximum range of the ZSU (3,000 meters), but roving guns usually maneuver outside the main defensive position and actively seek out encounters with enemy aircraft. They will aggressively engage any aircraft within range and then quickly proceed to a new location.

There is one tactical maneuver which must be discussed due to the Soviet's special vulnerability to attack helicopters. The river-crossing operation presents a unique opportunity to the attack helicopter since the ZSU is not amphibious and, as a result, will not be able to continuously provide air cover throughout the operation. As a result, speed of crossing is emphasized continuously. Initially, the ZSUs will assume firing positions about 300 to 500 meters before the water's edge to protect the tanks being prepared to snorkel across the river. In the case of a motorized rifle battalion, the SA-7 gunners will usually cross amphibiously with their companies. That is the extent of dedicated air defenses across the river until the ferries are put into operation. The first vehicle to cross on the ferry will be a ZSU.

Obviously, the battalion is most vulnerable to air attack after the companies have crossed the river but the ZSUs have not. If the air attack could be coordinated with artillery fire delivered approximately 400 meters deep on the Soviet side of the river, there would be increased opportunities for killing tanks. Under no circumstances should attack helicopters cross over to the enemy's side of the river where the concentration of ZSUs will be waiting, several in ambush positions.

What are the vulnerabilities of the ZSU and how can they be exploited? *The first, and most often neglected, vulnerability of the system is that while it is the best, if not the only, truly effective air defense weapon against attack helicopters, it is limited in number. Therefore, if it could be deliberately attacked as the first priority target, the Soviet air defenses would be severely weakened.* For example, a tank regiment has 118 armored vehicles. The only truly effective air defense against attack helicopters is the organic ZSU-23-4 battery which consists of only four ZSUs. Simply stated, killing one ZSU mount leaves nearly 30 armored vehicles of this unit without effective air defense against attack helicopters.

The silhouette of the ZSU is certainly another vulnerability. The vehicle is difficult to mistake in a column of BMPs or tanks. The prominent GUN DISH radar and the four-barrel assembly allow it to be distinguished quickly in a column.

Curiously, the ZSU's greatest strength, its radar, can be used to the attack helicopter pilot's advantage. The Soviets write very little concerning the effectiveness of this radar. One article describing the ZSU reports the following data: "Planes or helicopters flying over open country at an altitude of 100 meters can usually be detected at a distance of not more than 10 to 15 kilometers (km), whereas over a closed countryside they can appear in the area of a target completely undetected." Electronic warfare devices can be used to jam the ZSU radar. The potential is always there with any system of this type. As a radar tracker, the ZSU emits a unique signal, an electronic "signature." This can be used to identify and locate the unit. The onboard AN/APR-39 can be used to signal the ZSU's existence, proximity and general direction. The GUN DISH antenna of the radar can be destroyed by artillery fragments, mortars, rockets, etc.

How effective is a ZSU without radar? In recent articles the Soviets have provided some information on an answer to that. One article describes the sequence involved in firing a ZSU in the optical mode—relating how the operator must lay the tubes in the direction of the target by turning the handle of the control panel, shift the sight lever to the "doubler position," align the open sight with the axis of the bore, set the distance grid with the indicated range, bring it up under the target and press the button on the control lever to fire a short burst. In this case, he missed. The senior sergeant made a correction for wind and range and ordered long bursts until the target was destroyed. Obviously, the ZSU without radar is far slower. In this case a stationary target at 2,000 meters was missed the first time. The short burst would certainly have alerted the attack helicopter pilot.

Although the above sequence would appear to take quite some length of time to perform, the question "how long?" was not answered until the following article appeared in 1979: "In a timed test without radar the majority of the crews were slow, much time

was wasted finding the targets, refining and using the fire data. The result of this is that they opened fire, as a rule, 2 minutes after the helicopters appeared. At this point the commander took his best-trained crew and ordered them to fire as soon as possible. The crew was lauded for opening fire in 32 seconds . . . without making a single mistake."

How do those times compare with the launch of a TOW missile? The flight time of a TOW missile from 3,000 meters is about 14 seconds; from 3,750 meters it is 21 seconds. Therefore, a total exposure time for the aircraft is in the order of perhaps 15 to 25 seconds, if the pilot immediately remasks. It is during this time period that the "average" ZSU crew must detect, acquire, fire at and hit the attack helicopter.

To continue with vulnerabilities of the ZSU radar, it is clear from Soviet descriptions of the ZSU during exercises that it cannot prepare to engage one target while scanning for others. Therefore, the concept of a decoy aircraft, say a "scout," to unmask and remask at approximately 3,500 to 4,000 meters range from a ZSU would allow an attack helicopter to strike undetected from a flank position.

If it can be hit, a ZSU can be destroyed. It is a comparatively "soft" target. The ZSU armor has a maximum thickness of 6.3 millimeters in the front of the crew compartment and 9.2 millimeters on the hull. The T-54/55/64 tanks, by comparison, have armor varying from 3 to 6 inches in thickness. Not only can heavy machinegun fire penetrate the turret and hull of the ZSU, but its tread and road wheels are subject to damage by artillery; and high-explosive fragments can penetrate its armor, destroy the radar dish and rupture the liquid coolant sleeves of the 23 mm cannons.

Another vulnerability in a mid-intensity conflict could turn out to be the ZSU's high rate of fire. The amount of ammunition carried (1,300 to 2,500 rounds) and rate of fire (3,400 to 4,000 rounds/minute) have been confirmed in the Soviet press. Simple mathematics will reveal that the onboard ammunition supply will be exhausted in 45 seconds of continuous fire.

Current U.S. tactics do not separate the destruction or suppression of Soviet air defenses from degrading enemy combat power per se (i.e., killing tanks). In initial engagements, killing tanks in column with a ZSU is equivalent to drawing on a gunslinger's horse. The first target is the "gunslinger" (ZSU), then all the "horses" are vulnerable. Presently, U.S. attack helicopter tests and evaluations tend to teach the wrong lessons. Each pilot and his commander is concerned with the final tank vs. helicopter ratio. That is the number that will be carved in granite at the close of the exercise. Will it be 12:1 or better? What is missing is a credit factor for ZSU kills. One ZSU should be worth at least 10 tanks in exercise play; it will be worth far more on the battlefield. Also, nearly all tests are computed on repetitions of "first" exchanges of fire or simulations in which the ZSUs cannot be destroyed. If kill ratios are to be meaningful and predictive, second and third engagements should be considered, after the ZSUs have been destroyed. The resulting kill ratios would be spectacular.

Larger helicopter units should be used in antiarmor attacks. The standard "one scout/two gunships" tactic allows the enemy forces to concentrate their attention and fire on a few targets. Tests should be conducted with attack helicopter companies supporting brigades and destroying the ZSUs as first priority. Again the results would be startling.

In cases when the ZSUs of a unit have been destroyed, whether by air or ground forces, those units must be considered high priority targets for future air activity, both by TACAIR and helicopters. They must be tracked and destroyed.

Clearly, the air defense battle is a battle of attrition. The winner and loser will be determined by who runs out first. The employment of attack helicopters should be viewed in this light. If attack helicopters achieve a 12:1 kill ratio against tanks but all are destroyed in the process, there will still be tanks—and stopping them will be far more difficult.

Perhaps the U.S. Army should review the lessons of the last great air defense battle of the Vietnam war. In December 1972, B-52 attacks on military targets surrounding Hanoi involved about 1,000 sorties in 11 days. The North Vietnamese countered with SA-2 missiles, firing as many as 100 at a time. U.S. electronic countermeasures were saturated by these massed attacks, and B-52 losses peaked at six on the third and fourth days. At this point, the Air Force changed tactics and struck the SAM and radar sites with fighter-bombers and air defense suppression F-4s. By the fifth day, no B-52s were lost. The battle of attrition was won; North Vietnamese Army radars could no longer track targets, and the B-52s "flew at will." Soviet sources clearly indicate that the ZSU-23-4 is the attack helicopter's "SA-2." If these can be suppressed and destroyed, perhaps the attack helicopters can "fly at will" without suffering 4 days of losses.

ABOUT THE AUTHOR

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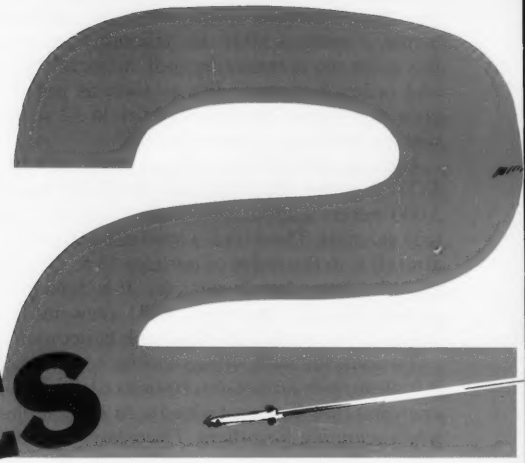


2 CHANGES 2.75 Inch

THE SUN IS JUST beginning to spread its rays over the green rolling German countryside in the 3d Armored Division sector. It has been a busy night for the soldiers of the division, but the years of thought, planning and practice that went into preparing and implementing the division's general defense plan are paying dividends. The covering force has nearly finished its rearward passage of lines through the 1st Brigade sector, and although it has suffered casualties, it has given a good account of itself in disrupting the first and second echelons of the enemy attack. A few hours to conduct consolidation and resupply operations will allow the covering force to maintain its status as a combat effective force.

One armor company remains in the covering force area, decisively engaged with the enemy. The 1st Brigade commander, who has been in control of the covering force to his front for several hours, turns to the 503d CAB for a little added leverage to allow the beleaguered armor company the opportunity to conduct its rearward passage. LTC Dashing, the 503d CAB commander, notes from the spot reports generated by the armor company in contact that he will be expected to engage an enemy motorized rifle battalion cross reinforced with a tank company. He decides to keep six modernized AH-1 Cobras in the air continuously, engaging the enemy force until the passage is complete. He will launch four Cobras in a heavy TOW (eight each) configuration and the remaining two Cobras configured with a maximum load of 2.75 inch rockets.

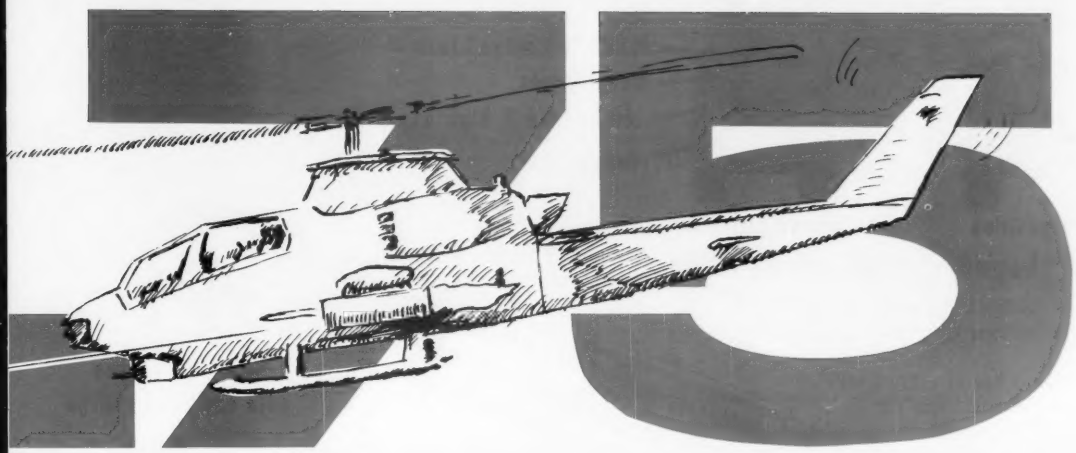
Wait a minute—LTC Dashing obviously has his wars confused. Anyone who would shoot 2.75 inch rockets at BRDMs, BMPs and T-72 tanks has to be an optimist at the very least, and most probably is missing a few screws in his head. We all know that the 2.75 inch rocket is an area fire weapon, and that if one elected to fire a complement at an armored column, all he would probably do is irritate the recipients of those rockets.

Before we pass judgment on the competency of LTC Dashing, we need to take a look at some of the latest aircraft armament research and development products being fielded.

First, the new M260 and M261 lightweight launchers that, when installed on the Modernized Cobra, give the pilot of the aircraft the capability to independently set the mode of operation and/or the function range for the new electronic rocket fuzes from the cockpit.

Then consider that the new MK66 rocket motor, when fired from the AH-1S(MC), has the capability of delivering a variety of warheads out in excess of 6,000 meters *accurately*.

Couple these capabilities with the new Multipurpose Submunition (MPSM) warhead and the thought



2.75 Rocket System Upgrade

of taking on armored vehicles with the 2.75 inch rocket system at extended ranges begins to enter the realm of distinct possibilities. The MPSM warhead increases the lethal effectiveness and utility of the 2.75 inch rocket system to include:

- The ability to engage a variety of battlefield area targets comprised of materiel, personnel or light armor.
- The ability to engage targets by direct or indirect fire out to 6,000 meters, with the additional capability to select any range from 1,000 to 6,000 meters through the use of a cockpit remote settable fuze.

In order to do all of the above, the development of the warhead required a departure from traditional 2.75 inch rocket warhead designs. In looking for a single warhead to replace many of those previously used, the developer settled on nine individually fuzed M73 HE shaped charge submunitions. Each submunition body is scored internally to optimize fragment size against personnel and materiel. The body is then filled with composition B high explosive; a truncated copper cone and a wave shaper provide a shaped charge sufficient to damage or destroy most armored vehicles upon impact with the top of the vehicle (figure 1). Each submunition is fuzed with an M230 stored energy "all ways" fuze. "All ways" means that the fuze will function regardless of impact angle.

To give you an idea of exactly how potent the MPSM warhead is, consider the fact that just *one* of the nine shaped charge M73 submunitions possesses about 75 percent of the lethality against a prone target of one current 10 pound M151 HE warhead.

M73 submunition will also penetrate armor, whereas an M151 HE warhead will not. After taking into consideration a certain amount of desirable overlap in coverage between the MPSM's nine shaped charges, a single warhead possesses

GLOSSARY

BMP	Russian infantry combat vehicle
BRDM	Russian reconnaissance vehicle
CAB	Aviation Battalion (CBT)
CBT	combat
FCC	fire control computer
FCS	Fire Control System
HE	high explosive
HUD	heads up display
LRF	laser range finder
LTC	lieutenant colonel
MC	Modernized Cobra
MPSM	multipurpose submunition
NOE	nap-of-the-earth
RAD	Ram Air Decelerator
RMS	Rocket Management System
SM	submunition
TOW	tube-launched, optically-tracked, wire-guided
TSU	telescopic sight unit

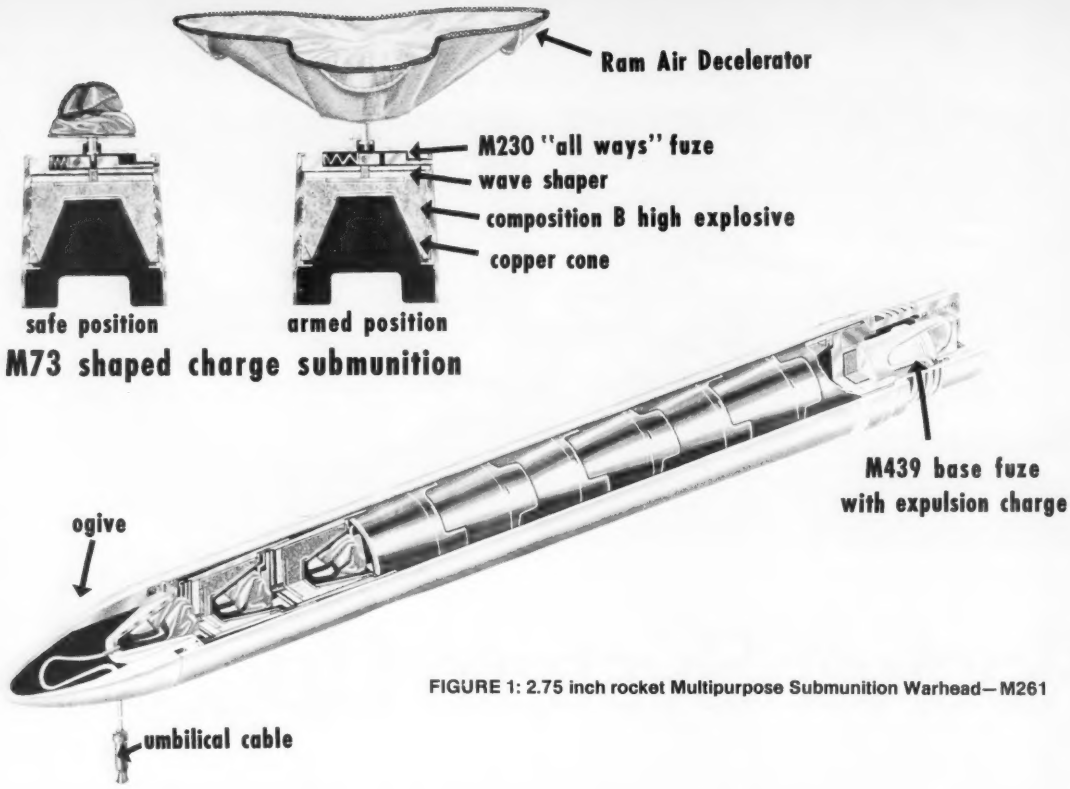
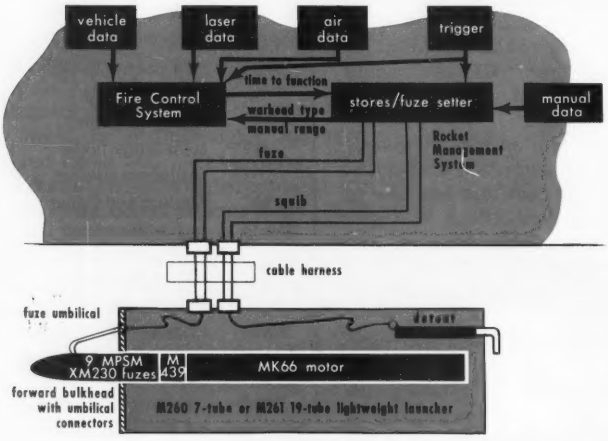


FIGURE 1: 2.75 inch rocket Multipurpose Submunition Warhead—M261

FIGURE 2: Production AH-1S (MC)



a lethality area against a prone target at least six times greater than the M151 HE warhead.

Think about that for a minute. The MPSM warhead represents a quantum jump in available battlefield firepower.

Now that we have increased the potency of the warhead over previous garden variety 2.75 inch warheads, our next trick is to be able to get those nine submunitions onto the desired target out to 6,000 meters.

The MPSM warhead is an airburst (payload ejected above the target area) delivered muniton, one of several airburst warheads scheduled for addition to the 2.75 inch rocket system inventory.

Our nine shaped charges are each equipped with a Ram Air Decelerator and loaded into the warhead case (figure 1). The RAD inflates when the SMs are ejected from the

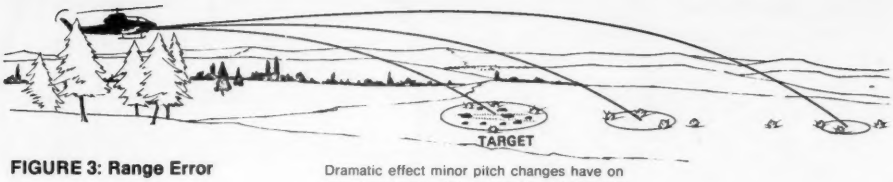


FIGURE 3: Range Error Dramatic effect minor pitch changes have on impact points when firing conventional HE rockets

FIGURE 4: Multipurpose Submunition "Wall In Space" MPSM functioning at computed range allowing SMs to descend almost vertically on target area

warhead case, initiates arming of the "all ways" fuze, acts to arm the submunition, controls vertical descent into the target areas, and serves to disperse and scatter the submunitions after ejection, thereby reducing overlap and increasing munition coverage.

The warhead case is capped with a nose cone (ogive) equipped with an umbilical connector which plugs into the launcher so that the warhead can receive fuze charge information from the aircraft. The umbilical is connected by internally routed wiring to the M439 fuze with its expulsion charge at the base of the warhead.

The M439 fuze is a remotely settable time fuze that has a resistance-capacitor circuit which translates an electronic charge to range by discharge time that corresponds to the selected range based on rocket time of flight. Its primary function is to initiate the expulsion charge in the base of the warhead, which in turn expels the submunitions into the airstream at the appropriate preselected range. The time (range) can be set manually from the cockpit by dialing in range on the Rocket Management System cockpit control panel, or automatically with the aircraft Fire Control System which integrates the laser range finder, the fire control computer and the RMS. System interfaces are shown in figure 2.

Attack helicopter pilots are well aware of the difficulties encountered to date when attempting to engage targets with the 2.75 inch rocket from terrain flight and nap-of-the-earth altitudes. The shallow angle of attack produced when firing from reduced altitudes invariably creates elongated elliptical patterns in the target area. Very small deviations in aircraft pitch attitude have a profound effect on the range of something moving as fast as the 2.75 inch rocket. Figure 3 depicts range error introduced from minor increases in pitch attitude. The MPSM fired from the Modernized Cobra virtually eliminates range error. The MPSM relies on the "wall in space" concept to negate longitudinal aircraft pitch deviations and to increase range accuracy. This concept is depicted in figure 4, and described below.

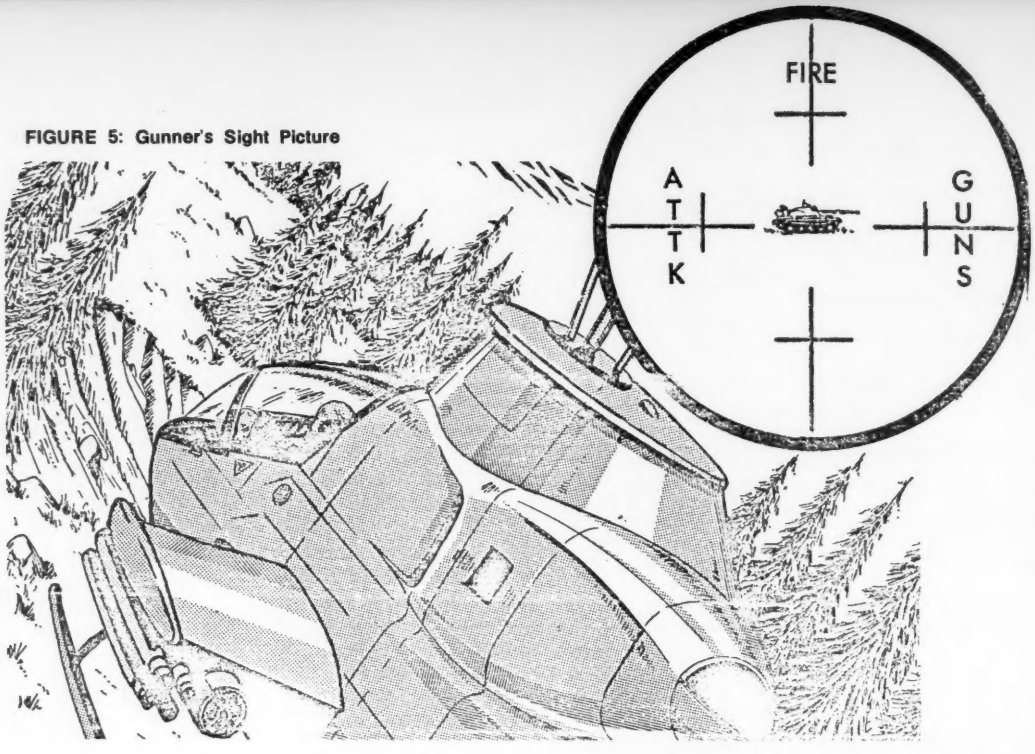
The pilot dials in the MPSM rocket and quantity to be fired on the RMS. The RMS designates this data to the FCC, and the FCC selects the MPSM/MK66 trajectory data from memory. The electronic fuze setter in the RMS will set the fuze when the pilot depresses the firing trigger.

The gunner in the front seat of the Cobra sights in on the target through the telescopic sight unit (figure 5) and lases to obtain constantly updated range data. The aircraft FCC processes this data along with aircraft speed, relative wind, temperature and flight characteristics of the rocket, and computes the point in space at which the MPSM must function in order to hit the intended target. The computer then presents a solution reticle through the heads up display (figure 6) to the pilot in the back seat. All he must do is match the solution reticle to the boresight reticle on the HUD by maneuvering the aircraft and firing the weapon system. The computer continues to constantly update the solutions as the aircraft moves along. The pilot pitches the aircraft up, aligns the boresight reticle with the solution reticle and depresses the firing trigger. The fuze receives the latest ranging data about 50 milliseconds prior to the rocket motor being fired.

Fire! The sequence illustrated in figure 7 occurs upon firing of the rocket—initial forward motion of the rocket causes set back weights in the M439 fuze to seat, and the fuze time is initiated.

- At the computed determined time (at a point slightly before and above the target area), the M439 fuze initiates the expulsion charge.
- Expulsion charged gas pressure forces the SMs forward, the ogive

FIGURE 5: Gunner's Sight Picture



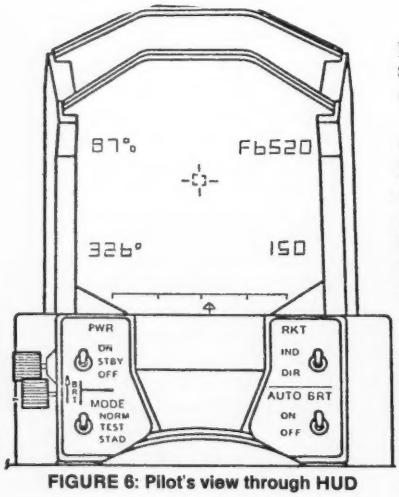


FIGURE 6: Pilot's view through HUD

shear pins shear and the payload ejects into the airstream.

• On airstream entry, each RAD inflates, spreading the SMs and initiates the arming sequence of each M230 fuze, while also stabilizing each SM into a near vertical fall into the target area.

• Each SM descends, at an approximate rate of 80 to 90 feet per second, with less than 6 degrees of coning.

• Upon impact with any object, or the ground in the target area, the M230 fuze initiates the HE, shooting a shaped charge jet downward and spraying lethal fragments nearly horizontally in a 360-degree pattern around the impact point of each SM.

Because the fuze receives very sophisticated range information, and because the MPSM functions normally at 300 to 400 meters above target elevation, causing the shaped charges to descend nearly vertically onto the target area, we now have a very accurate 2.75 inch rocket weapons system. Pitch errors may cause the MPSM to function above or below the computed point; but because it does function at a computed range (wall in space), shaped charges have either more or less time to descend vertically, rather than more or less time to change range because of rocket flight. Consequently, the traditional elevation ranging error is *no longer* traditional.

One of the real advantages of firing the MPSM from the Modernized Cobra, especially in light of the trade-offs encountered when considering the choices of more firepower or more fuel and consequently more station time, is that the pilot can fire a substantially reduced number of rockets in an engagement with reasonable confidence that he can hit the target, even at extended ranges.

During recent tests conducted at Yuma Proving Grounds, AZ, MPSM warheads with MK66 motors were fired from a Modernized Cobra. All shots were from reduced altitudes at ranges in 1,000-meter increments from 1,000 meters to 6,000 meters, with airspeeds covering hover, 40 and 90 knots. Rockets were fired one at a time for 10 to 14 iterations at each range and airspeed combination. The MPSMs consistently impacted within a 40-meter radius of each other for each range air-

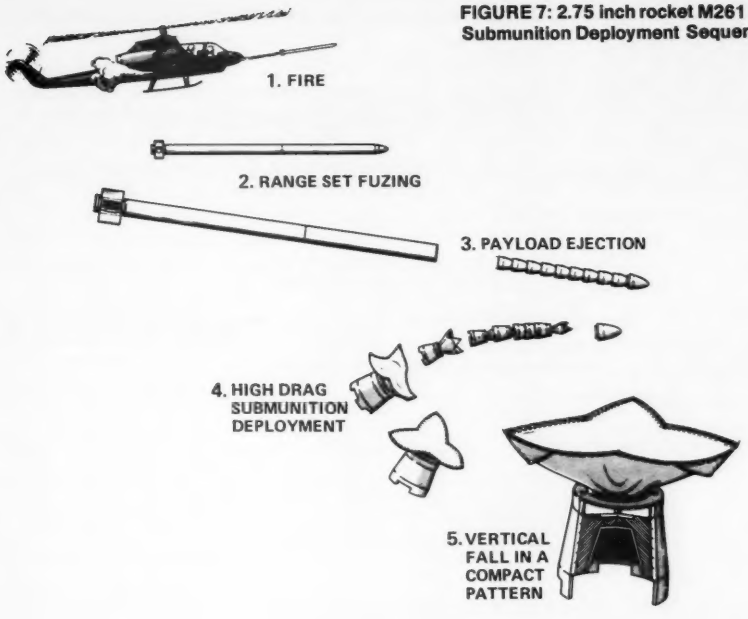


FIGURE 7: 2.75 inch rocket M261 Multipurpose Submunition Deployment Sequence

speed combination, despite the variables induced by firing only one rocket for each firing pass. The data presented could lead one to believe that the 2.75 inch rocket system equipped with an MPSM rocket is approaching point target accuracy. While that may be an overzealous statement, the fact is that the MPSM does provide target coverage consistently and is a very potent weapon.

The integration of the MK66 motor with the MPSM warhead into the Army arsenal presents some interesting tactical considerations. How will we employ this combination to take maximum advantage of its capabilities? Current doctrine indicates that flank engagement of armored columns with TOWs at ranges from 3,000 to 3,750 meters will offer Army aviators the best chance of achieving satisfactory kill ratios. Armor columns moving toward known or suspected enemy locations logically orient the preponderance of their observation capabilities and firepower in the direction of the enemy, with a lesser amount devoted to the flanks and rear. An armor column has reduced observation capabilities when it is forced to button up. If enough of an incentive can be created to cause that column to deploy out of their formation, button up and orient toward the apparent threat, then Cobras maneuvering into TOW range from the flanks are going to be presented an excellent opportunity to inflict heavy enemy casualties.

A logical technique for causing all of this to happen would be to have one or two Cobras equipped with 2.75 inch MPSM rockets engage the column or formation head on from 5,000 to 6,000 meters. The flash of firing rockets and the virtual "rain" of armor-penetrating shaped charges on the enemy formation will cause them to do something, and that something will be oriented upon the helicopters firing the submunitions. Because the MPSM does not require the helicopter firing it to remain exposed for long periods of time, NOE firing techniques could be used effectively, especially at extended ranges, to avoid becoming the recipient of all of that antiaircraft capability Warsaw Pact forces possess.

Consideration of a few facts concerning the Cobra fire control system would help the crew to maximize the effect of its attack. Time of flight of the MK66 rocket with the MPSM warhead at various ranges is shown in figure 8.

If the aircraft crew engaged a column 2,000 meters long head on with the rear of the column 6,000 meters from the aircraft, the gunner could start sighting somewhere short of the rear of the column and move his TSU reticle slowly to a point in front of the column. The pilot in the rear seat could fire a pair of MPSM equipped rockets every second for 8 seconds as the gunner moved his sights in from 6,000 to 4,000 meters along the column. By using this technique, all 16 rockets would impact nearly simultaneously, spread out evenly along the column. Meanwhile, the aircraft will have

remasked or can engage again while the target is being suppressed.

These rounds have a very good probability of hitting the column, and they will defeat light armor. They may or may not defeat a tank, but they will defeat any crewmembers' heads sticking out of the tank. Everyone still alive after this barrage will definitely consider closing his hatch. With the reduced visibility, loss of considerable observation capability and the confusion that is sure to follow, TOW equipped Cobras operating from the flanks are going to be presented with "an offer they can't refuse." Figure 9 portrays the scenario described.

The possibilities based on different scenarios are endless; however, it should be apparent that the 503d CAB commander made a sound choice in electing to devote a portion of his fighting force to the employment of MPSM warhead 2.75 inch rockets.

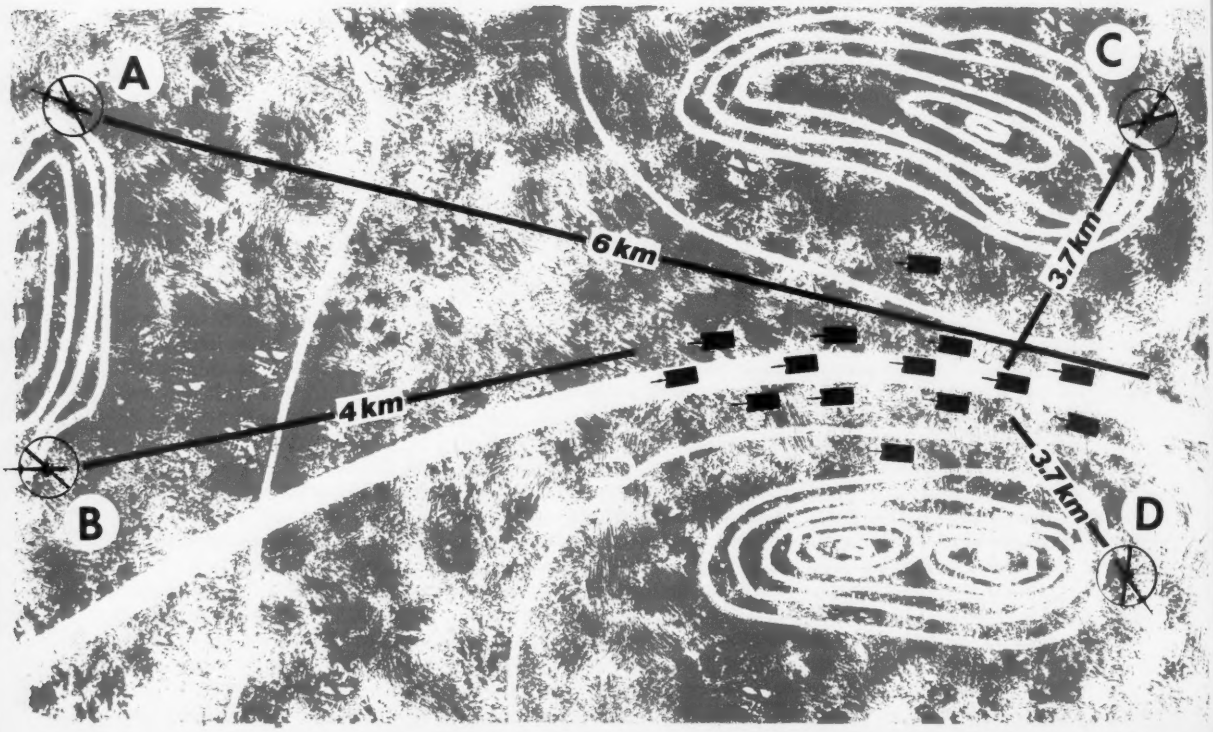
Coincidentally, the M267 MPSM training warhead is also ready for introduction into the improved 2.75 inch rocket system. It is physically and ballistically matched to the M261 warhead but contains nine flash smoke M75 SMs. With the existence of the M267 training warhead, commanders will be able to practice and develop unit MPSM deployment techniques suitable to their own particular missions.

The systems and components discussed represent a vast improvement in the accuracy and flexibility of the Cobra as a battlefield force in the medium and high intensity environment. This, along with the almost continuous flow of technological advances associated with aircraft armament systems, should cause us to devote some thought to effective training and employment techniques.

KM	M439 Fuze Function Seconds	Nominal SM Descent Seconds	Time To Impact Seconds
6	17.5	12	29.5
5	12.5	12	24.5
4	9.5	12	21.5
3	5.2	12	17.2
2	3.3	12	15.3
1	1.5	12	13.5

FIGURE 8: Cobra Fire Control System

FIGURE 9: Employment possibility. Cobras A and B engage enemy at 4 to 6 km head-on with MPSM, while Cobras C and D engage from the flanks with TOWs



U.S. Army Communications Command
ATC ACTION LINE

NOISE ABATEMENT

THE FOLLOWING information is extracted from Federal Aviation Administration Advisory Circular 91-36B. All aviators are encouraged to follow the suggested practices and demonstrate to the public the Army's concern for a better environment:

1. **PURPOSE:** This advisory circular encouraged pilots making VFR flights near noise-sensitive areas to fly at altitudes higher than the minimum permitted by regulation and on flight paths which will reduce aircraft noise in such areas.

2. **BACKGROUND:**

a. The Federal Aviation Administration continually receives complaints concerning low flying aircraft over noise-sensitive areas. These complaints have prompted requests for regulatory action prohibiting low altitude flight over identified noise-sensitive locations. We believe that a satisfactory solution can be realized by means of a pilot/industry cooperative endeavor rather than through the regulatory process.

b. Increased emphasis on improving the quality of the environment requires continued effort to provide relief and protection from aircraft noise.

c. Excessive aircraft noise can result in discomfort, inconvenience, or interference with the use and enjoyment of property, and can adversely affect wildlife. It is particularly undesirable near outdoor assemblies of persons, churches, hospitals, schools, nursing homes, noise-sensitive residential areas and National Park Areas which should be preserved as important historic, cultural, and natural aspects of our national heritage.

d. Adherence to the practices described below would be a practical indication of pilot concern for environmental improvement, would build support for aviation, and forestall possible regulatory action.

3. **VOLUNTARY PRACTICES:**

a. Avoidance of noise-sensitive areas, if practical, is preferable to overflight at relatively low altitudes.

b. Pilots operating fixed and rotary wing aircraft under VFR over noise-sensitive areas should make every effort to fly not less than 2,000 feet above the surface, weather permitting, even though flight at a lower level may be consistent with the provisions of FAR 91.79, Minimum Safe Altitudes. Typical of noise-sensitive areas are: outdoor assemblies of persons, churches, hospitals, schools, nursing homes, residential areas designated as noise sensitive by airports or by an airport noise compatibility plan or program, and National Park Areas (including Parks, Forest, Primitive Areas, Wilderness Areas, Recreation Areas, National Seashores, National Monuments, National Lakeshores, and National Wildlife Refuge and Range Areas).

c. During departure or arrival from/to an airport, climb after takeoff and descent for landing should be made so as to avoid prolonged flight at low altitudes near noise-sensitive areas.

d. This procedure does not apply where it would conflict with ATC clearances or instructions or where an altitude of less than 2,000 feet is considered necessary by a pilot in order to adequately exercise his or her primary responsibility for safe flight.

4. **COOPERATIVE ACTIONS:** Aircraft operators, aviation associations, airport managers, and others are asked to assist in implementing the procedures contained herein by publicizing them and distributing information regarding known noise-sensitive areas.

Readers are encouraged to address matters concerning air traffic control to:
Director, USAATCA Aeronautical Services Office, Cameron Station, Alexandria, VA 22314

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Aviation Life Support Equipment (ALSE) School

Fort Eustis, Virginia

The ALSE School is in full swing and is conducting courses of training in ALSE on inspection, maintenance and repair of this critical equipment. Recent visits by staff personnel and the Aviation Life Support Equipment Management Steering Council revealed the determination and dedication of the instructors and the overwhelming enthusiasm of the students. Even with this zeal, we feel we can help to make the training better through making available adequate training aids. We are therefore asking others in the ALSE community to look around and see if you have any items of ALSE which could be sent to the school for their use. Please call one of the following instructors on AUTOVON 927-3001/5510: MSG Jack Ooten; SFC Bruce Amos; SGT Barney Baker; SGT Frederico Western; and if all else fails you can call Mr. Ed Daughety, AUTOVON 693-3307. PEARL will certainly appreciate any support you can give.

A. B. C. Davis Jr.
DARCOM Project Officer
Aviation Life Support System